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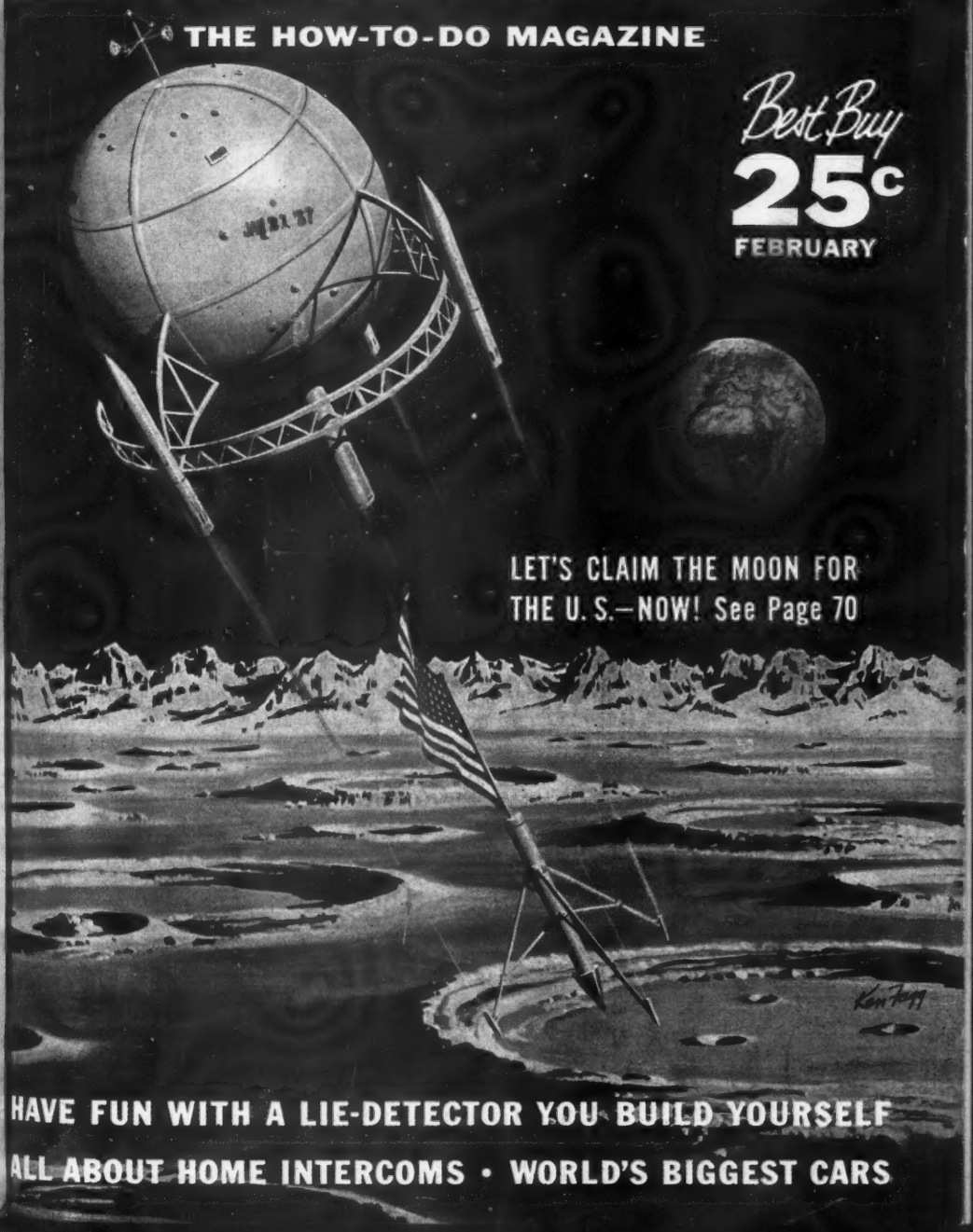

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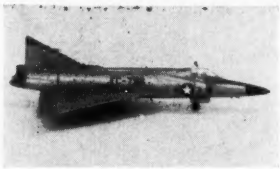

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Cross-Country Cruise Ship.....*Frank Tinsley* 62
Let's Claim The Moon—Now! (Cover).....*Pierre J. Huss* 70
Your Career In Aeronautical Engineering....*Lester David* 78
They Write On Air.....*Irv. Leiberman* 96
So You Think *This* Is Cold?.....*Lawrence Sanders* 102

TOM McCAHILL

Tests The '57 Lincoln 84
Tests The '57 Pontiac 88
How To Race Your Car At Daytona..... 105
Mail For McCahill..... 170

REGULAR FEATURES

This Month's Bright Idea: Presto-Paster..... 67
Inventions Wanted! 74
MMI: They Got Rich On Ribs.....*Eda Johnstone* 81
Pin-Up Car: 1906 Autocar..... 92
Eye-Stoppers 93
It's New! 99

SHORT FEATURES

Do You Want $5,000?..... 66
Radio-Controlled Rats 68
Clock With A Brain..... 73
World's Largest Cars..... 75
King-Size Model Train Layout..... 94
Mr. Ough's Little Ships..... 104

DEPARTMENTS

Conquest Of Space: The World's Safest Business..... 14
Invention Clinic 20
Dear Editor 26

(continued on page 10)

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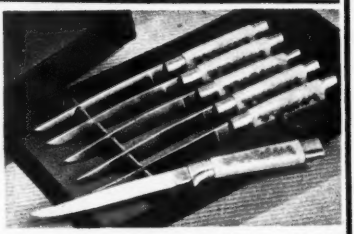

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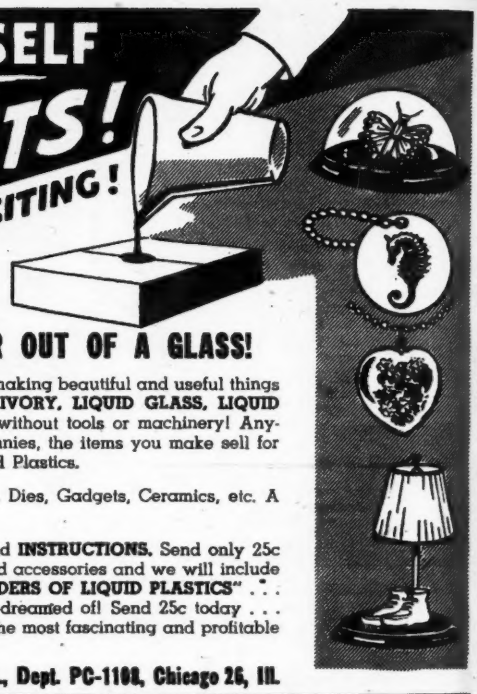

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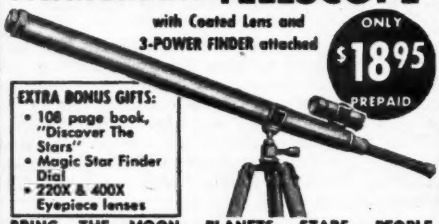

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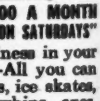

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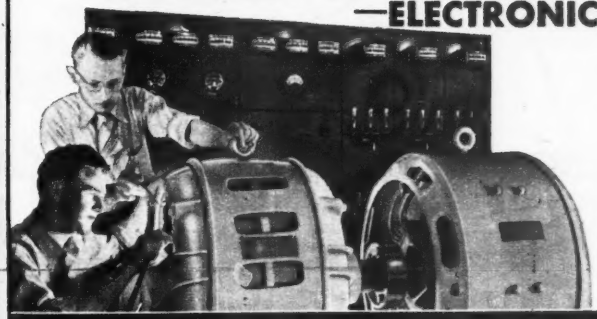

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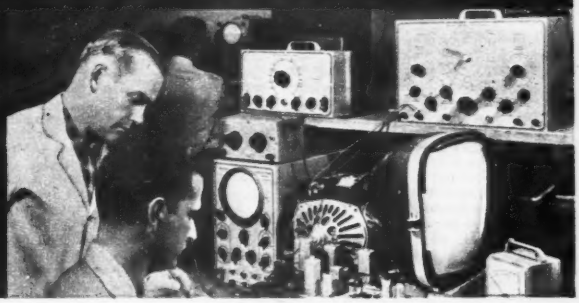

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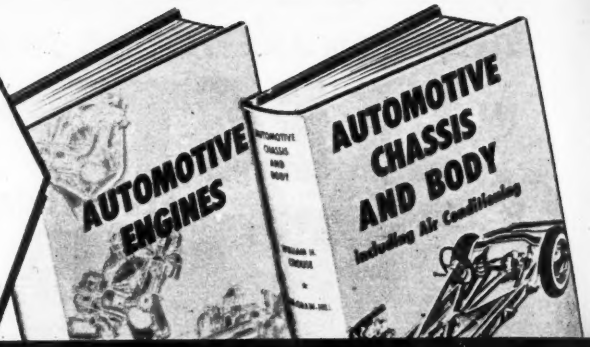

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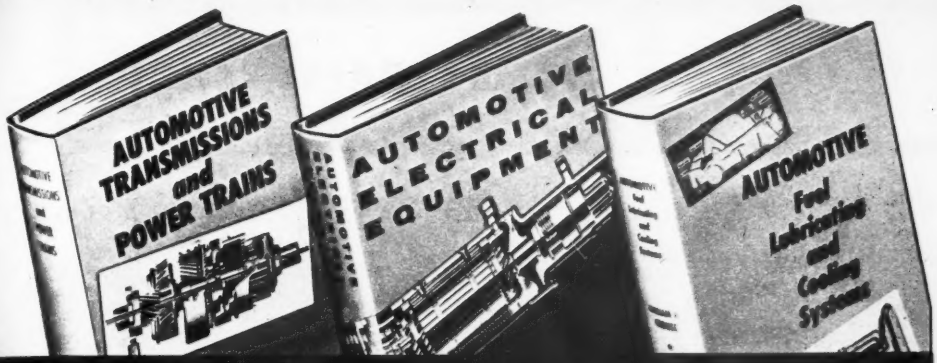

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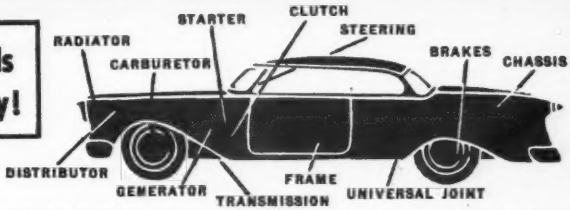

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continued from page 2

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Custom Lamp 114
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Adjustable Wall Shelves 130
Radiator Cabinet 136

SPECIAL FEATURES

Have Fun With A Lie Detector 120
How To Build A Garage 124

BOATS AND BOATING

Plywood Tips For The Boatbuilder 140

AUTOMOTIVE

Does Your Car Need An Oil Filter? 144

PHOTOGRAPHY

Photography Today 148
Monthly Photo Contest 150
Photo Tips 153

DEPARTMENTS

Fresh Paint Tips 116
Home And Shop Tips 118
Freddie Fumbles 118
What's New In High Fidelity 123
Hardware Store 134
Telescope Page—Open Frame Telescope 154
Book Notes 157

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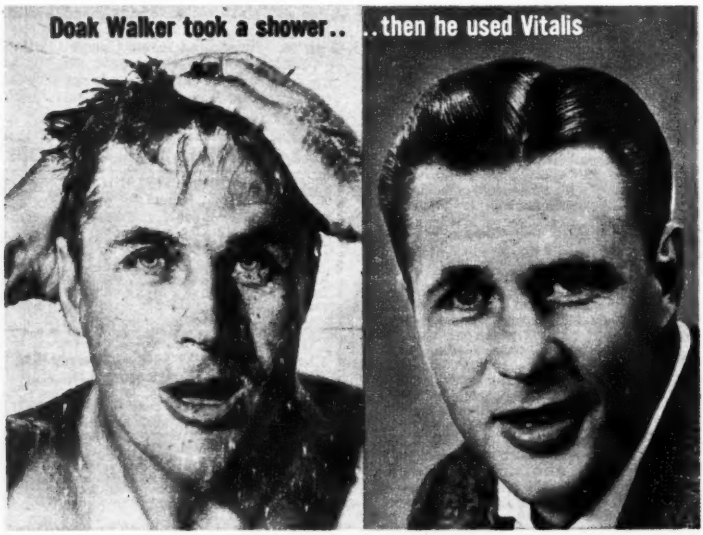

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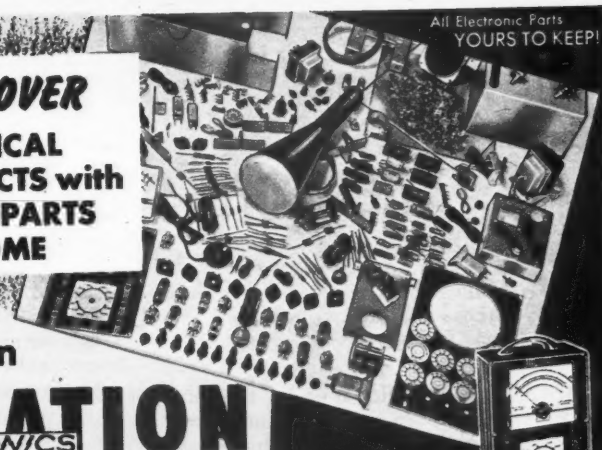

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Conquest of Space

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By G. Harry Stine
Viking-Aerobee Operations Engineer
White Sands Proving Ground

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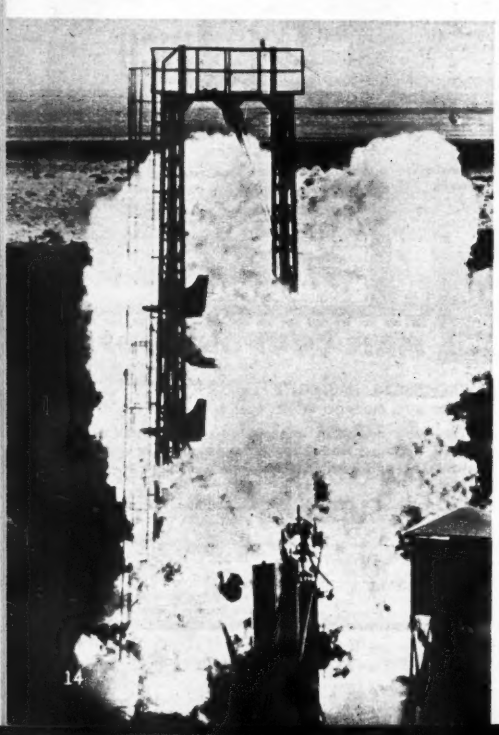
3. When mixing solid propellants, do so by diluting them with water and wear a shatterproof face shield. When working with liquid propellants, check with the manufacturer or a chemistry teacher to learn what protection you should have against their toxic effects.

4. When you fire a rocket, do so by electrical [*Continued on page* 18]



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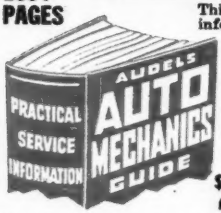

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[*Continued from page* 14]

means. Keep the firing leads shorted or grounded both at the rocket and at the firing switch until the last possible moment. Make certain your are at a safe distance in case of an explosion. *Do not use blasting caps* for anything! Use a length of nichrome wire to heat up a small bit of black powder to give you a puff ball of flame for ignition. If you have a misfire with a rocket, put all safeties back on at once and do not approach the missile for at least an hour.

5. When you fire a rocket, do it far away from any building or inhabited area. Before shooting, obtain permission from the owner of the land to do so. Don't fire in a wind, and always fire in a safe direction; "up" is not safe, so shoot at a slight angle at least.

6. Obtain the help and advice of somebody in your area who knows something about chemistry, physics, explosives, or science in general. Don't go blundering by yourself. You won't have trouble getting help for rockets *are* exciting devices! •

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Invention Clinic

[*Continued from page* 20]

you ask your attorney to search the records to learn if you have something new. Then I suggest that you purchase all available 180° hinges and make your own tests.

Gas Engine Camshaft

John C. McRobbie of West Covina, Calif., has designed a dual profile camshaft which will allow for smooth idling at slow engine speeds yet will give the high power of a racing camshaft. The control is to be automatic and based on engine speed. What do we think?

In your design of a dual profile cam you will find an infinite number of positions during which the warped or transition face of the cam will bear against the outside edges of the pusher rods, or any similar units controlling the valves. At the instant that the rod strikes the low speed face there is a strong possibility that you will get a

[*Continued on page* 24]

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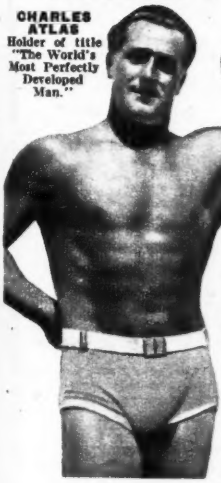

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Invention Clinic

Joseph H. Kraus

In this column each month Mr. Kraus will answer as many letters as space permits on those subjects he feels to be of widest general interest. Time does not allow him to reply to any letters except those printed here. Address your questions to the Invention Clinic, *Mechanix Illustrated*, 67 West 44 St., New York 36, N. Y.

Dividing Head—Work Support

James A. Crain of Hackensack, N. J., sends drawings of a low-cost dividing head for a lathe and patent drawings and photographs for a milling machine work support. Are these marketable?

Regarding the dividing head; except for the fact that you have moved the dividing plates to the extreme left end of the spindle instead of locating them within the front spindle gear or fastening them under or on the face plate, you have suggested nothing new. Your adjustable milling machine work support does not seem as good as the popular steady rest which gives support at each of three equidistant points around the circumference. You seem to have designed a unit serving a purpose halfway between a follower rest and a steady rest. While your second idea seems better than your first, neither strikes me as commercially promising.

Heterodyne Radio Circuit

Ira J. Austin of Palm City, Fla., sends a diagram for a one-tube radio circuit and explains its operation. Is this new?

You may have made an important discovery that should definitely be pursued; I have never heard of anyone getting the results you report. Recheck every position in your circuits to be sure that you are not getting accidental rectification. Then, if the picture still looks good, substitute components one at a time. Then, if you still get the same results, first disconnect one circuit and then the other from your "speaker" to establish that you are not being misdirected. If the results remain the same, have your attorney report on a patent search.

Concrete Building Blocks

Alex C. Fabris of San Antonio, Texas, sends patterns for concrete blocks designed to make it easier for do-it-yourself enthusiasts to build concrete walls. Worth patenting?

You must allow for mortar between the blocks. While this could be done with your blocks by the use of properly placed molded projections, it is not a new concept. Although many styles of concrete blocks have been patented, few are in production. Their cost of production is greater, breakage is higher and there are not enough amateurs demanding a simplified-block. In your attempt to produce conduit space you failed to consider the danger of making the walls too thin for safety in manufacture or handling.

Invisible Hinge

E. Mercereau of New Westminster, B. C., says he has invented and made a crude model of an invisible hinge which will permit a cabinet door to open a full 180°. Does this constitute an improvement on present hinges?

Possibly it does; I would need additional details to pass judgment. Many different styles of door hinges now on the market will do the same job. I recommend that

[*Continued on page 22*]

INVENTORS

If you believe that you have an invention, you should find out how to protect it. The first step is to have a search made of the prior pertinent U. S. patents. If a report on this search indicates that the invention appears patentable you can apply for a patent, and the specifications and claims should be prepared.

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If you consider your invention valuable, take these necessary preliminary steps promptly to protect it by applying for a United States patent.

Sketch and describe your invention. (For convenience in starting action on your invention, use "Evidence of Invention" form offered below.)

Sign, date and have this invention disclosure witnessed by two people capable of understanding your invention.

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REGISTERED PATENT ATTORNEY
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Invention Clinic

[*Continued from page* 20]

you ask your attorney to search the records to learn if you have something new. Then I suggest that you purchase all available 180° hinges and make your own tests.

Gas Engine Camshaft

John C. McRobbie of West Covina, Calif., has designed a dual profile camshaft which will allow for smooth idling at slow engine speeds yet will give the high power of a racing camshaft. The control is to be automatic and based on engine speed. What do we think?

In your design of a dual profile cam you will find an infinite number of positions during which the warped or transition face of the cam will bear against the outside edges of the pusher rods, or any similar units controlling the valves. At the instant that the rod strikes the low speed face there is a strong possibility that you will get a

[*Continued on page* 24]

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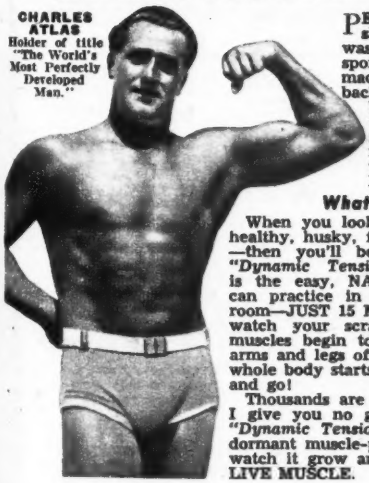

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Invention Clinic

[*Continued from page* 22]

dual thumping simultaneously against both the transition surface and against the cam face. I think that any of the available systems which permit any present day camshaft to be moved automatically with relation to the timing gear would do the job you are attempting to do.

Duplex Wardrobe

William P. Boyd of Brooklyn, N. Y., has designed a duplex wardrobe which he proposes for sale in kit form. Will it work mechanically?

You seem to have gone to a lot of trouble to develop a minor convenience. Your system would function properly only when the weight of the clothes and rack is counterbalanced by the weight. If clothes and rack are heavier the wardrobe would tip forward unless it is secured to the floor. If lighter, then the rack will move back into its closed position. Your design demands rigidity of the assembled parts but you provide no bracing nor locking features to assure this rigidity. Hence your rods would wobble and jam against the sides. Finally, with all of this hardware, counterweights and cords, your production cost would be entirely out of line with what you might expect the public to pay for the unit. •

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Dear Editor

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● *Keen Shave*

Dave Warther (One-Man Knife Factory, Nov. '56 MI) proves his point all right, in that picture of him shaving with one of his own cleavers. If he really wants to get a close cut, he ought to try one of the axes we use in our logging camp up here in the woods. It's a pretty heavy razor—but it sure does a keen job on stubborn whiskers.

Pierre Fravel
Winnipeg, Canada

Do you ever miss?

● *February MI Mystery*

When I am as old as my father is now I shall be five times as old as my son is now. By then, my son will be eight years older than I am now. The combined ages of my father and myself are 100 years. How old is my son?

Ray Edwards
Westfield, Mass.

● *December Mystery Solved*

Your December mystery was no problem for an old-time railroader. The answer is 33 feet.

Jack Toomey
Erie, Pa.

● *Tall Tale*

Tall Tales of Texas in Nov. '56 MI reminded me of the story about two only modestly wealthy Texans who flew up to New York on a lark one afternoon to have lunch. After dining, Joe paid the bill over the protests of his friend Hank. The pair then strolled down the street and stopped to admire a Lincoln Continental display in an auto showroom. The Texans marched in and picked out two Continentals they liked. Joe reached for his wallet.

"Wait a minute," Hank said. "This is on me. You got the lunch."

Jesse Brokton
Houston, Texas

[*Continued on page* 33]

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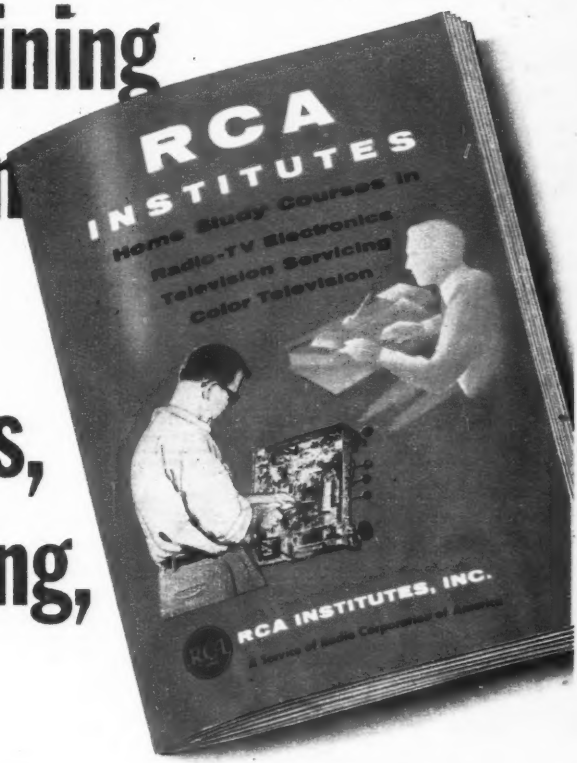

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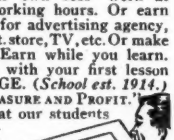

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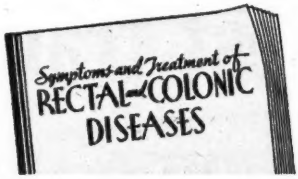

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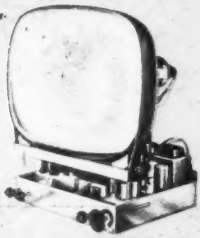

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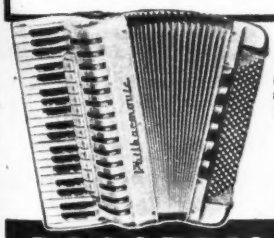

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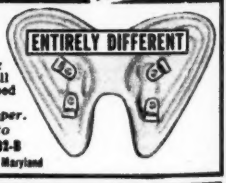

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Dear Editor

[*Continued from page* 26]

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• *Vive La France*

A reader of your magazine for some years, I was agreeably surprised to read your article. (France's Answer To The Volkswagen) on the new Dauphine Renault in May '56 MI.

The technical information you gave in it is surprisingly fair and I assure you that I did not think that this "baby," as you call it, would interest the U. S. public. Please accept my congratulations on the excellence of all your articles.

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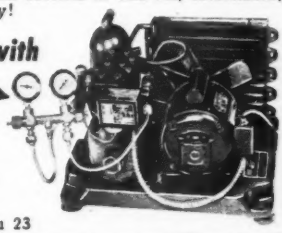

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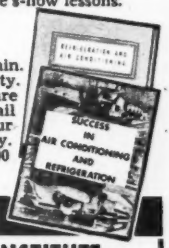

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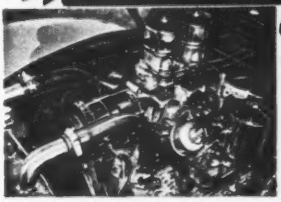

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Checks fuses, appliances, etc. Easy, safe to use. Insert tube in socket. Pilot light instantly indicates if tube needs replacement. Rugged metal case (not plastic). AC or DC. One service call saved pays for tester. Only 3.95 ppd. or C.O.D. plus charges. DeLuxe model 4.95. Instructions. 5-yr. guarantee. **GEIGER ENGINEERING CORP., Dept. DE-100, 6349 N. Western Ave., Chicago, Ill.**

GETTING UP NIGHTS

If worried by "Bladder Weakness" (Getting Up Nights or Bed Wetting, too frequent, burning or itching urination) or Strong Smelling, Cloudy Urine, due to common Kidney and Bladder Irritations, try CYSTEX for quick help. 30 years use prove safety for young and old. Ask druggist for CYSTEX under guarantee of money-back if not satisfied. See how fast you improve.

GIANT BALLOONS

Biggest & best! Surplus US Govt. (new overage) Neoprene weather target balloons.
FOR FUN—Great in backyard, at parties, picnics, fairs. Young & old enjoy 'em!
FOR ADVERTISING—Attract big crowds to business openings, civic events, trade shows, exhibitions. Paint 'em with a sales message and they'll pay off for you!
FOR PROMS—Makes any high school or college prom more festive. Real cool!

Approx. inflated sizes
3 ft. dia., 49c—5 ft. dia., 99c

Postage paid on prepaid orders. Cal. res. add sales tax.

VOLUME SALES CO., War Assets Divisions
3930 Sunset Blvd., Dept. MI-257, Los Angeles 29, Calif.

SMALL INVESTMENT PUTS YOU IN GOOD PAYING BUSINESS OF YOUR OWN

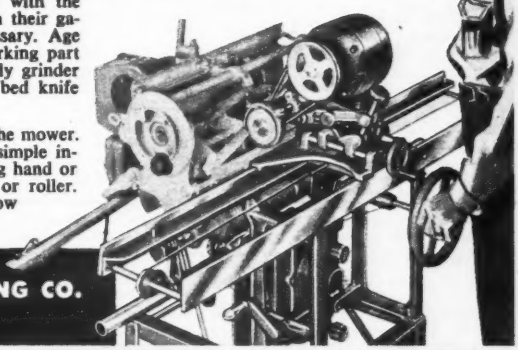
ROGERS MANUFACTURING CO.
Dept. L-27, Lindsey, Ohio
Gentlemen: Please rush complete details about the big-profit possibilities of the Universal Lawn Mower Grinder. **FREE**

Name _____
Address _____ State _____
City _____

SHARPENING LAWN MOWERS IN SPARE OR FULL TIME . . . AT GOOD PROFIT.

Thousands are successfully earning good money with the Universal plan of a spare or full time business in their garage or basement. Previous experience not necessary. Age no handicap. C.H.R. of Ohio made $3,688.20 working part time, in one season. The new Universal is the only grinder in the world that enables you to grind both the bed knife and reel blades . . **IN A SINGLE SET-UP**

. . . without removing them from the mower. Just put the mower in the grinder, follow a few simple instructions and you can do an expert job sharpening hand or power mowers without removing engine, handle, or roller. SEND COUPON today for success plan of this low investment big pay business of your own.



ROGERS MANUFACTURING CO.
LINDSEY, OHIO

Do YOU Want to Qualify for A BETTER JOB AT BIGGER PAY?

CLIMB TO $UCCE$$!

in Spare Time at Home

• Jobs are calling—calling to those who want more responsible jobs, in bigger pay brackets, with increasing chances for promotion—and who have the ambition to devote some of their spare time to acquiring necessary knowledge and skill. As little as just a few hours a week, in time you can easily spare, *can* produce surprising results in lifting you up to higher and higher levels of employment, income and security—even eventually to management positions or a business of your own. In the coupon below are listed some of the large number of training opportunities offered by AMERICAN SCHOOL—now in its 60th year. Check the one that interests you most and fill in your name and address. Or if you prefer some other career, write the subject in the margin. Then mail the coupon without delay.

FULL INFORMATION . . . NO COST . . . NO OBLIGATION

AMERICAN SCHOOL, Dept. G228, Drexel at 58th, Chicago 37, Ill.

Without obligation, please send FREE and postpaid, full particulars about the subject checked below.

- ☐ Accounting
- ☐ Apprenticeship Courses
- ☐ Architecture & Building
- ☐ Automotive Technician
- ☐ Better Foremanship
- ☐ Blu-print Reading
- ☐ Bookkeeping
- ☐ Business Management
- ☐ Civil Engineering
- ☐ Contracting
- ☐ Diesel Technician
- ☐ Drafting—Building Trades
- ☐ Drafting—Machine Trades
- ☐ Electrical Engineering
- ☐ Electricity—Practical
- ☐ Electronics—Industrial
- ☐ HIGH SCHOOL COURSES
- ☐ Machinists
- ☐ Mechanical Engineering
- ☐ Mechanical Technology
- ☐ Metalworking Courses
- ☐ Plumbing—Practical
- ☐ Private Secretary
- ☐ Retail Merchandising
- ☐ Salesmanship—Outside
- ☐ Sheet Metal Work
- ☐ Tool Making

Name..... Occupation.....
Home Address..... Age.....
City..... State.....

• Canadians: Write American School, Dept. G-228, 6083 Sherbrooke St. W, Montreal

MI Classified Ads

Your advertisement can reach this mail-buying audience of more than a million readers for only 90c per word . . . payable in advance (Check or M.O. please) . . . minimum 10 words. Copy to be inserted in April issue must be in the office February 3. Mail to MECHANIX ILLUSTRATED, 67 West 44th St., New York 36, N. Y. Word count: Zone number free. Figure one word: Name of state (New Jersey), name of city (New York); sets of characters as in key (14-D); also abbreviations as 35MM, 8x10, D.C., A.C.

SAVE MONEY • ORDER BY MAIL

• • • ADVERTISING & BUSINESS SERVICES

ADVERTISE: 24 WORDS, 100 Canadian Newspapers, $5.50. Lists Free. Advertising Bureau, 10511-B Springfield, Chicago 43.

ADVERTISING POST Cards: 150 Words Printed On 1,000. $7.00 Postpaid. Nolan Printing, Box 5475, Chicago 7.

• • • AGENTS WANTED

RUN SPARE-TIME Greeting Card and Gift Shop at home. Show friends samples of our wonderful new 1957 All-Occasion Greeting Cards and Gifts. Take their orders and earn up to 100% profit. No experience necessary. Costs nothing to try. Write today for samples on approval. Regal Greetings, Dept. 23, Ferndale, Mich.

BARGAINS, JOBLOTS, closeouts. 2,000 items. Tremendous savings, clothing, toys, gifts, jewelry, television, etc. 25¢ brings wholesale catalog. $1.00 merchandise certificate included Free. Reliable Jobbing, 311-C North Desplaines, Chicago.

SHINE CARS Without "Polish." New invention. Lightning seller. Cars gleam like mirror. Samples sent on trial. Kristee 62, Akron, Ohio.

YOU CAN Make Money at home in spare time taking magazine renewal subscriptions. No capital or experience necessary. All supplies furnished. Write Today! McGregor Magazine Agency, Dept. 520A, Mount Morris, Ill.

BOOK "505 ODD, Successful Businesses" free. Work home! Pacific-21C, Oceanside, Calif.

EVERY MAN a prospect. Request Free Sales Kit. Show line of belt buckles, individualized with your own name and emblems, also transportation, police, firemen badges. Choice 3,000 emblems. Hook-Fast, Box 1425-MI, Providence, R. I.

PRINTING, ADVERTISING Salesmen—Excellent moneymaking sideline selling Decalcomania Name Plates, small quantities. Automobile initials, Sign Letters. Free Samples, "Ralco," XL, Boston 19, Mass.

YOUR OWN business—Suits $1.50; Overcoats 65c; Mackinaws 35c; Shoes 12½c; Ladies' Coats 30c; Dresses 15c. Enormous profits. Catalog Free. Nathan Portnoy Assoc., 605-M West 12th Place, Chicago 7, Ill.

BUY WHOLESALE thousands nationally advertised products at big discount. Free "Wholesale Plan." American Buyers, Hertel Station, Buffalo 16-WI, N. Y.

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FRANCHISES OPEN. Low cost quality Chamois sweep market. Chamtana, Hudson Falls, N. Y.

FREE! "301 PROFITABLE Small Businesses!" Amazing shoestring plans! Work home! Start sparetime! Daumant Surveys, Kenmore 23-MI, N. Y.

BUY WHOLESALE! Discounts to 80%! Appliances, Cameras, Sporting Goods, Housewares, Watches, Tools, Clothing, etc. Buy Rite 73-27, Wagaraw, Hawthorne 2, N. J.

YOUR OWN Wholesale Business Without Investment. Free catalog. Norris, 487-J Broadway, New York.

FREE! SUNSHINE'S Studio Everyday Assortment-Special introductory offer to big profits available selling Sunshine exclusive everyday cards, imprinted stationery, gift wraps, deluxe 21 card assortment, etc. Free catalog. Send postcard today for sample kit on approval. Sunshine Art Studios, Inc., Dept. MI-2, Springfield 1, Mass.; Pasadena 1, Calif. (East of Rockies address Springfield).

FREE! BEAUTIFUL Feather Pictures 200% Profit! Apartado 9036, Mexico 1, D. F.

GREETING CARDS—$50.00 cash from 40 boxes sensational All-Purpose Assortment. Big money all year from special occasion cards—Mother's, Father's Day, Birthdays, Eastern Star. Best All-Occasion Assortments, Stationery, Gifts. Bargain Specials. Color Catalog. Samples on approval. Midwest, 1113 Washington, Dept. 678-B, St. Louis 1, Mo.

AMAZING "CUT Flowers" Greeting Cards sell fast! So real even stems are cut. Keep 85¢ on each $1.25 Everyday Assortment. $85.00 easy! 140 finest card, novelty, stationery money-makers. Gift Bonuses. Assortments on approval. Act fast—get "Hot Plate" Salt-Pepper Free! Creative, 4401 Cermak, Dept. 513-F, Chicago 23.

MAKE EXTRA Cash—Quickly! Show newest big value $1, $1.25, $1.50 assortments of Birthday, Get Well, Valentine, Easter Greeting Cards, Gift Wrappings, Stationery, Gifts—in spare time. Big profits, bonus. Friends, others buy on sight. Write for Samples on approval, Free Gift Offer, details. Hedenkamp, 361 Broadway, Dept. MI-42, New York.

$1,000.00 A MONTH for making dramatic 3-second demonstration of amazing lightweight Presto Fire Extinguisher. New chemical used by Airforce snuffs out fires instantly. Only $4.95. Terrific commissions. Millions want it. Free Kit. Merlite, 114 E. 32nd, Dept. P-695, New York 16.

GOLD OR Silver Letters, Numbers. Windows, Doors, Trucks. 1" to 6". 500% Profits—Free Samples. Atlas-R, 544 West 79th, Chicago 20.

$125 WEEKLY! 176% PROFIT! New wonder Car Polish with Miracle Dow-Corning silicones cleans, glazes, weatherproofs year 'round! Free sample, details. Write Royaltone Co., 1035 E. 10th St., Brooklyn 30, N. Y.

FREE "$5,000-$45,000; UNLIMITED Vacations." Work home! No merchandise, equipment! Haylings-MI, Carlsbad, Calif.

MEN, WOMEN, Make Money Spare Time plus New Car as Bonus for Encouragement. Amazing hosiery Guaranteed to wear without holes, snags, and runs, or replaced Free. For example, lovely 60 gauge nylons Guaranteed for as long as 1¼ years, or replaced Free. Write Wilknit, 1872 Wash., Greenfield, Ohio.

FREE!—GUARANTEED Homework Opportunities! Immediate Commissions! Hirsch, 1301-A Hoe, New York City 59.

IF YOU'RE interested in making money in selling, see the hundreds of exceptional opportunities in Salesmen's Opportunity Magazine. Send name for your copy, absolutely free. Tell us what you're selling now. Opportunity, 848 N. Dearborn, Dept. 46, Chicago 10, Ill.

CLEANS WINDOWS without mess. Strange "dry" cleaning-cloth. Replaces liquids. Windows gleam. Samples sent on trial. Kristee 61, Akron, Ohio.

60% PROFIT ON Cosmetics—famous nationally advertised Hollywood cosmetics pay 60%. Make $25.00 day up! Hire others. For free samples, details, write Studio Girl, Glendale, Calif., Dept. 5072G.

BUY WHOLESALE $1,350,000 Products. Literature Free. Carter, Box 6011-M, Chicago 80.

CALIFORNIA SWEET-SMELLING Beads. Sensational sellers. Free particulars. Mission, 2328GF West Pico, Los Angeles 6, Calif.

BUY WHOLESALE! 100,000 Name Brand Products. Save 66⅔%! Big profits selling others spare time! Free Catalogs! National Buyers Service, Box 3338GE, San Franciso.

EASY HANDWORK makes fast-selling articles. Sample free. Sunmade Company, Brockton 64, Mass.

• • • SALESMEN WANTED

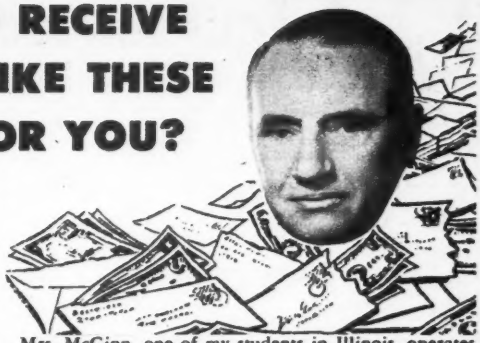
MY FREE Outfit Puts You In A Fine Business! Just 2 sales a day brings you up to $217 extra a month in Big Money shoe business! Complete line of Air Cushion shoes for men, women. Just rush postcard for your powerful Free Selling Outfit! Mason Shoe, Dept. C-52, Chippewa Falls, Wisc.

MAKE EXTRA Money. Cash commissions. Everybody buys easy-to-sell Advertising Book Matches. Union label. Big variety—Glamour Girls, Scenics, Hillbillies. Powerhouse selling kit Free. Steady repeat business. No experience necessary. Superior Match Co., Dept. F-257, 7528 S. Greenwood, Chicago 19.

NEW JOBS open in selling! Send name, address for five free issues of Opportunity Magazine's money-making guide, listing hundreds of companies who'll pay you well, full or part-time. No experience needed. Opportunity, Dept. 19, 850 N. Dearborn, Chicago 10.

GOLDMINE OF 600 money makers. Copy free. Specialty Salesman Magazine, Desk 7-B, 307 N. Michigan, Chicago 1.

WOULD YOU LIKE TO RECEIVE STACKS OF LETTERS LIKE THESE EACH WITH MONEY FOR YOU?



I have found a proven formula for quick success in making money. Others I've shared it with also have been successful. Would you like to know about it?

It's simpler than you might think – just buying good imports at next-to-nothing foreign prices and selling them in the U.S. by mail order or at wholesale to stores.

To most people, importing smacks of mystery, romance – and "costly" things for collectors. Actually, any capable and ambitious man or woman should learn import-export quickly. And, there are thousands of beautifully made imports obtainable at trifling cost abroad to sell in the U.S. by mail order. There are also great opportunities in exporting U.S. products.

Native villages in Africa, romantic Vienna, bustling Copenhagen, mysterious Hong Kong – yes, countryside hamlets and great cities all over the world produce fascinating products.

Using my plan, you don't have to travel abroad unless you want to. You don't even have to know a foreign language. And, there is no face-to-face selling in mail order.

I have proven this plan with 103 imports – and the opportunities for the sale by mail of thousands more are breathtaking in their possibilities. Hunting knives and binoculars from Germany, silverware from Sheffield, England – hand-carved art objects from Africa – all costing less than $1 abroad have values up to $5 or more here and are big sellers by mail order.

Monthly bulletins sent free to those who follow my plan show suppliers of new and desirable imports.

As I write this, I am receiving as many as 1,000 cash orders a day for imported clocks – all by mail order. They cost me only 63¢ and I sell them far below the U.S. market – a terrific bargain and a wonderful seller. And, I don't stock them as they are shipped direct to the buyers from abroad, *after I receive the cash.*

So you see, it is even possible to conduct a business of this kind without investing in merchandise.

Mrs. McGinn, one of my students in Illinois, operates a gift shop and sells Arabian perfume by mail order. F. Basler, N. J., sells Aztec bird feather pictures from Mexico to stores and by mail order.

You might ask, "Why do you let others in on your plan? Why don't you keep it all for yourself?" The answer is that items for import are countless. No one person could possibly handle even a small proportion of them. There's plenty of business in import-export for you and me and many others.

If you are sincere and really open-minded to a new and different opportunity – one which may change your whole idea of the kind of money you can make in your own full or part time business – write today for full details. Air mail reaches me overnight.

B. L. Mellinger, Director, Dept. G262
1717 Westwood, Los Angeles 24, Calif.

— — — — AIR MAIL THIS COUPON NOW — — — —

B. L. Mellinger, The Mellinger Co., Dept. G262
1717 Westwood, Los Angeles 24, Calif.

Mr. Mellinger: Without obligation, show me the big profits to be made through World Trade, especially in mail order from my own home.

Print Name.....

Address.....

Town & Zone.....State.....

When answering advertisements please mention MECHANIX ILLUSTRATED

I'll Send You This Handsome SAMPLE CASE-FREE

and Show You How to Make Up to $30.00 in a Day

Mail coupon for this Free Tailoring Sample Case packed with 150 beautiful, big-value suit and overcoat fabrics. Take orders from friends, fellow-workers, others, for fine quality, made-to-measure clothes. Pocket big cash profits in advance. Because wearing our suits and overcoats brings more orders, we make it easy for you to get your own clothes without 1c cost. No experience is needed. SATISFACTION GUARANTEED. SEND NO MONEY. Just fill out and mail coupon – today!

J. C. FIELD & SON, Harrison & Throop Streets
DEPT. D-1684 - CHICAGO 7, ILLINOIS

J. C. FIELD & SON, Dept. D-1684
Harrison & Throop Sts., Chicago 7, Ill.

Dear Sir: I WANT A MADE-TO-MEASURE SUIT TO WEAR AND SHOW, without paying 1c for it. Rush details and Sample Kit of actual fabrics, ABSOLUTELY FREE.

NAME..... AGE.....

ADDRESS.....

CITY..... STATE.....

HANDS TIED?

—because you lack a HIGH SCHOOL DIPLOMA

• You can qualify for an American School Diploma *in spare time at home!* If you have left school, write or mail coupon for FREE booklet that tells how. No obligation of any kind.

OUR 60TH YEAR

AMERICAN SCHOOL, Dept. H228
Drexel at 58th, Chicago 37, Illinois

Please send FREE High School booklet.

Name.....

Address.....

City & State.....

Complete Canadian Courses available. Write American School, Dept. H228, 60083 Sherbrooke St. W., Montreal.

MI CLASSIFIED ADVERTISEMENTS

ANYONE CAN Sell famous Hoover Uniforms for beauty shops, waitresses, nurses, doctors, others. All popular miracle fabrics—nylon, dacron, orlon. Exclusive styles, top quality. Big cash income now, real future. Equipment free. Hoover, Dept. B-102, New York 11, N. Y.

MONEY-MAKING OPPORTUNITY! Take big profit orders for world famous Patented Varieties Fruit Trees. Also Flowering Shrubs, Roses, Vines. Big Sales outfit Free. Stark Bro's, Desk 30127, Louisiana, Mo.

$1,000.00 A MONTH for making dramatic 3-second demonstration of amazing lightweight Presto Fire Extinguisher. New chemical used by Airforce snuffs out fires instantly. Only $4.95. Terrific commissions. Millions want it. Free Kit. Merlite, 114 E. 32nd, Dept. P-69S, New York 16.

AD MATCHES! Sell amazing designs—10, 20, 30, 40 and 240-light book matches. Bigger spot cash commissions; every business a prospect. Low prices for high quality. Repeats. Start without experience; men, women; full, part time. Buy nothing! Sales kit furnished. Match Corp., Dept. MI-70, Chicago 32, Ill.

MAKE $20 DAILY wearing new footwear sensation sent on approval. No experience needed to cash in with amazing "Dollar-A-Second" demonstration. Send shoe size. Flexiclogs, Box 26X-B, New Holstein, Wisc.

EXCLUSIVE LINE of personal initialed buckles, belts, cap badges, 3,000 emblems, etc. Hook-Fast, Dept. MI, Roanoke, Va.

GET NEW Shirt Outfit Free: make $90.00 weekly on 5 average orders a day. Famous quality Made-To-Measure dress and sport shirts at $3.95 up sell fast to all men. No experience needed. Full or part time. Write: Packard Shirt Co., Dept. 438, Terre Haute, Ind.

WILL YOU wear new suits and topcoats without one penny cost and agree to show them to friends? You can make up to $30.00 in a day even in spare time, without canvassing. W. Z. Gibson, Inc., 500 South Throop Street, Dept. D-626, Chicago 7, Ill.

• • • BUSINESS OPPORTUNITIES

WANTED: HOME producers, to be subcontractors. Cast plastic products for manufacturers in our Clearing House Service. Thousands of easily-made items required. Cash in at home, without previous experience. Plastic Service Associates, Dept. 2-MI, East Boston 28, Mass.

ANALYZE HANDWRITING for more income, prestige, success. Graduates making money, spare, full time. Many on TV, have own radio shows, write feature columns for newspapers. Others like Marge Alten, Detroit; Sam Johnson, Texas; Dr. Kraak, Tucson, featured in widely read columns. Real opportunity for intelligent men and women. Age no handicap. Sample lesson, illustrated, sent on request. Must be 21. Write today! IGAS, 2307 National Station, Department 614, Springfield 4, Mo.

FIX TYPEWRITERS. Inexpensive home course teaches Factory Secrets. Free Booklet. Write, Typewriter, Tarentum 3, Penna.

FREE FOLIO "$5,000-$45,000; Unlimited Vacations." No merchandise, equipment. Unknown! Work home—sparetime. Haylings, MI, Carlsbad, Calif.

BREED RARE Tropical Fish At Home. Earn Big Money! Learn Secrets! Help fill huge demand. Amazing Opportunity! Free Plan. Tropicals, Los Angeles 61, Calif.

START A Buying Service, buy wholesale thousands nationally advertised products. Make big profits selling at sizeable discounts. Postcard brings details. American Buyers, Hertel Station, Buffalo 16-Y1, N. Y.

IMPORT-EXPORT! OPPORTUNITY, profitable, world-wide, mail-order business from home, without capital; or travel abroad. Established World Trader ships instructions for no-risk examination. Experience unnecessary. Free details. Mellinger, G752, Los Angeles 24.

$70 WEEKLY—HOME, spare time. Simplified mail bookkeeping. Immediate income—easy! Auditax, 34757E, Los Angeles 34.

11,000 NEW PROSPECTS Daily. Baby record books, shoes, albums. Sell mail-order. Everything furnished. Free literature. No-Co-Ro, Capitola 16, Calif.

GROW ORCHIDS at home—profitable—fascinating. Year 'round, Maine to California. No Greenhouse. Gorgeous Cattleyas, Cymbidiums, etc. Successful home grower shows you how. Free—full details. Flowerland, 100 South Vermont Avenue, Los Angeles 4, California.

BRUSH PLATING Outfits for plating articles in the home and shop. No tanks necessary. Good income spare or full time. Free particulars. Gunmetal Co., Ave. A, Decatur, Ill.

VENDING MACHINES—No selling required. Send for Free 32-page illustrated catalog describing our numerous coin machines; also showing you how you can earn Amazing Profits either full or spare time. Parkway Machine Corporation, Dept. 31, 715 Ensor St., Baltimore 2, Md.

NEWEST SPARE, Full-Time Business. $5 to $10 hour possible. Paint with Suede—the finish with touch *and* eye-appeal. Beautify auto dashboards, signs, radios, toys, figurines, lamps—1,001 others. Complete, Step-By-Step Instructions sent for no-risk examination. Free details. Coast, Dept. FY, Los Angeles 61.

PORTABLE GARBAGE Disposal Sells Itself! Earn $2,135 monthly. 100% profit. No installation UL approved. Retails $89.50. Choice territories. Free demonstrator offer, kit. Write today. New-Home Co., 52, P. O. Box 840, Beverly Hills, Calif.

YOUR ENVELOPES addressed accurately, reasonably. Fast service. We have capable addressers in your city. Glenway System, Box 6568, Cleveland 1, Ohio.

METALIZE AND Pearl finish baby shoes, jewelry, gifts, figurines. Free catalog. Bronze Craft, 11029 South Vermont, Los Angeles 44.

ONLY NEW moneymaking plan!! We sell your products. You build luggage and cases at home—we supply instructions—materials — tools — everything. Free details, Casecraft, 807-JB Sunset, Los Angeles 12.

"HOW TO Start a Business" booklet sent Free! If you Know any Trade—go into business for yourself! Learn the 9 easy steps to follow. We've guided 5,000 others to success. Revealing Free Booklet yours for the asking! Write! National Business Consultants, Office FY, Los Angeles 61, Calif.

YOU CAN become an Associated Discount Distributor, operating mail order discount business. Offer gifts, appliances, cookware, housewares, cutlery, dinnerware, silverware, jewelry, watches, etc., at discounts to 75%! No stock investment. We drop ship your orders. Catalogs printed your name can cost you nothing. Postcard brings free sample catalog, all details. Topval Corp., Lindenhurst 329, N. Y.

YOUR OWN name brand business. No investment; no inventory. Part time or full time. Sell famous brands of appliances, housewares, silverware, radios, vacuum cleaners, lamps, tools, clocks, watches, jewelry, etc., etc., over 1,000 items. Join thousands of successful independent dealers. Send for Free catalog and dealer price list. H. B. Davis Corp., Dept. 16, 145 W. 15 St., New York City.

YOU CAN Make Money at home in spare time taking magazine renewal subscriptions. No capital or experience necessary. All supplies furnished. Write Today! McGregor Magazine Agency, Dept. 5208, Mount Morris, Ill.

FREE! "301 PROFITABLE Small Businesses!" Amazing shoestring plans! Work home! Start sparetime! Daumant Surveys, Kenmore 23-MI, N. Y.

WAXES FLOORS Without "Wax." New Invention. No more floor wax to buy. Sensational seller. Samples sent on trial. Kristee 107, Akron, Ohio.

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LEARN PHOTO-NEGATIVE (Portrait) retouching. Men, Women. $5 hour possible spare or full time at home. Easy, glamorous. Work for Photographers by mail order. Full details sent Free. Duval, 100 So. Vermont, Los Angeles 4.

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LEARN SEWING Machine Repairing. To $125.00 weekly. Sparetime. Supplies. "Add to present business." Write today! Taylor Service, Box 2126, San Bernardino, Calif.

MAKE ATTRACTIVE, durable, building plastic, easily. 800% profit. Exclusive district. Bays Laboratory, Oklahoma City 9.

BECOME A Game Warden, or join Forestry, Park, Lookout, Wildlife Conservation services. Enjoy outdoor work, good pay, real security. Complete information Free! Write "Home-Study Institutes." 1036-KFY South La Brea, Los Angeles 19, Calif.

$60 WEEKLY, SPARE Time—Easy! Home Venetian Blind Laundry. Free Book. Burtt, 2434C, Wichita 13, Kans.

50% PROFIT BAKING new greaseless doughnuts in kitchen. Grocers buy daily. Free recipes. Irving Ray, 3605 South 15th, Minneapolis 7, Minn.

World's Most THRILLING HOBBY!

HOW TO GROW ORCHIDS PROFITABLE Home Business

NATURE'S MOST FABULOUS FLOWER In Your Own LIVING ROOM!

NO GREENHOUSE NEEDED
YEAR 'ROUND - ANY CLIMATE
MAINE TO CALIFORNIA

"Very pleased with Schirmer's Course, it contains so much information. The plant on my left had 6 blooms. 2 were cut off before picture was taken. The one on my right also had 6 blooms."
JAMES COSTO —Ohio

Fill your Home with ORCHIDS Every Month of the Year!

LOUIS and GLADYS SCHIRMER SUCCESSFUL HOME-GROWERS, SAY: *"We'll Show You How We Raised Orchid Plants Worth a Fortune—Starting At Home in Spare Time."*

NO GREENHOUSES NEEDED... *Successful family of home growers* now reveal their secrets for your pleasure and profit. Learn exciting facts about raising beautiful Orchids *at home* . . . how to grow *dozens* of varieties in every rainbow color . . . have Orchids in full bloom *every month of the year!* Many grow without soil, getting food from the air. NO GREENHOUSE NEEDED. Start on table or window ledge.

THRILLING HOBBY—Exciting Home Business. Imagine the delight of watching gorgeous Orchids burst into bloom *right in your own living room!* The big lavender corsage Orchids you see in every flower shop—also many others in all sizes and colors. Orchids for your own enjoyment, for gifts or to sell at good profits.

FINE PROFITS—Any location—Retail—wholesale—Mail Order. Learn how to market your Orchids for profit, no matter where you live – small town, big city, or on a farm. Millions sold by mail order, year 'round. Tropical Flowerland's "Quick-Profit Plan" helps you start at once, without investment in stock. No overhead.

SCHIRMERS' complete instructions and blooming-size Orchid plant sent for examination in your own home—NO OBLIGATION TO BUY A THING...

Schirmer's Course is complete, nearly 300 large size pages filled with show-how drawings and photos—many in full color. Shows how to grow 30 different kinds of Orchids at home. How to market Orchids for extra income spare or full time. Also includes blooming-size Orchid plant. Send no money, just fill out and mail the coupon today —airmail is quicker.

TROPICAL FLOWERLAND, Dept. 42, 100 S. Vermont, Los Angeles 4, Calif.

Home Growers Coast to Coast Benefit from the Schirmers' Help

My Orchids are doing fine. I sell many blooms and haven't really started to try yet. I owe my success to the Schirmers.
MRS. FRANK HARWOOD—Oregon

Growing Orchids for profit lets me have my business at home. When I first saw your ad. I had never seen an Orchid.
MRS. SEABIE SMITH —Arkansas

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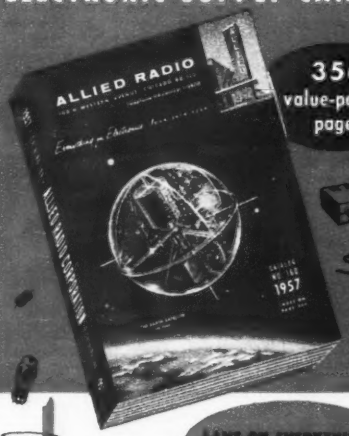

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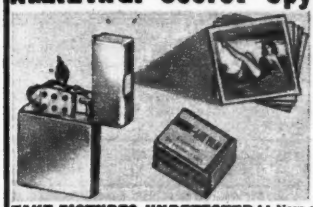

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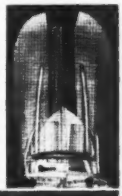

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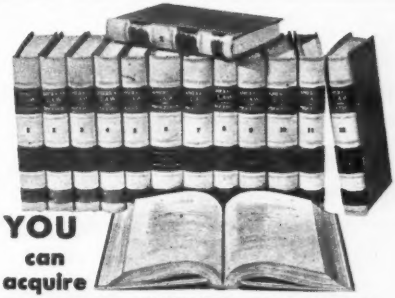

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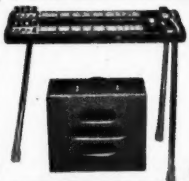

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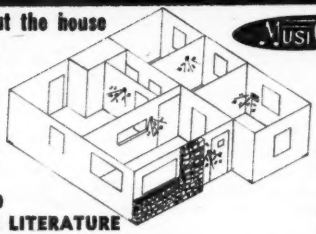

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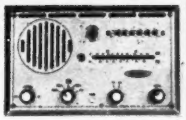

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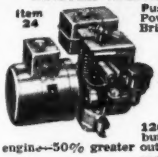

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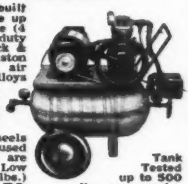

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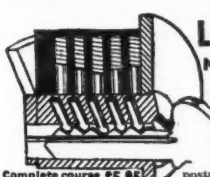

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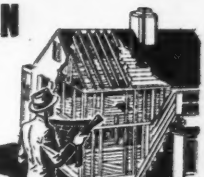

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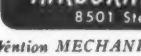

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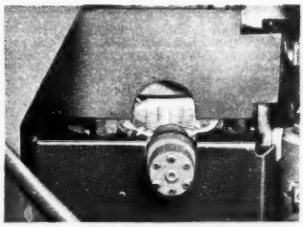

3 . . . automatic grinder takes "Guide Points" down to proper height with gem-like precision. When grinding is complete, lamps can then be aimed with amazing precision.

YOU GAIN because perfect aim is a must these days when new industry-approved advances build greater power and a new, more efficient pattern into most headlamps. However, to get the benefits of this increased power (10% more light on the high beam) and improved pattern (80 feet more "seeing distance" on the right for "low-beam" driving) headlamps *must be perfectly aimed*. This means lamps must be within a fraction of a degree for horizontal aim, and must be held to even closer tolerances in the vertical plane.

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Pressurized mashed potatoes are now possible; photo below shows Du Pont aerosol display.

Your favorite food may soon be available in push-button containers with the exciting new Polysol packing process.

By Robert G. Beason

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The ad man knew whereof he spoke. One of his other clients was a manufacturer of women's hair lacquer. It was a good product but sales were poor —until he started packaging the lacquer in an aerosol container, a pressurized

can with a push button on top. In three years' time, sales of the lacquer increased 25-fold!

America's love of ease and convenience has created a whole new aerosol industry almost overnight. Anyone who can remember World War II is able to span the complete history of aerosols. Two U. S. Department of Agriculture researchers started it all in 1944 when they discovered that insecticides could be dissolved in solvents and liquefied gases and dispensed under pressure. The result was the bug bomb, a heavy-duty aerosol that became as useful to the GI as his M-1 rifle.

All wartime production was taken by the government. But when the shooting was over, dozens of insecticide makers, using the USDA's free patent, reduced the aerosol to hand size and put it on the market. Production amounted to only a few thousand in 1946, then jumped to 5½ million the next year. The boom had begun. Consumers and industry in 1955 bought 235 million aerosols and the final 1956 figure is expected to be over a quarter-billion.

One of the keys to this phenomenal growth is adaptability. The industry has adapted more than 100 items to aerosol containers since the first days when only bug killers came with push buttons. Today you can press a button to grease heavy gears, paint a wall, apply shoe polish, give the ailing dog a shot of medicine, put on nail polish, squirt cream on strawberries, put out a fire, relieve the pain of sunburn, cover the Christmas tree with snow or administer a soothing drug to an asthmatic trachea.

A great many products are *not* found in aerosol form, notably some lotions, pharmaceuticals, cosmetics, alcoholic beverages and most foods. The reason lies in aerosol propellants—gases used to force a product out of the container. Most are refrigerated gases, or fluorinated hydrocarbons, the same substances that keep the home refrigerator cold. The two principal brands are Freon, made by Du Pont, and Genetron, made by Allied Chemical & Dye.

Trouble is, they never have been cleared by the U. S. Food and Drug Administration as safe for use with foods. They also cannot be used with most waterbase materials (like rubbing alcohol) because of chemical reactions that change the product and corrode the can. Refrigerants have a chilling effect when they hit the skin, so most lotions are out.

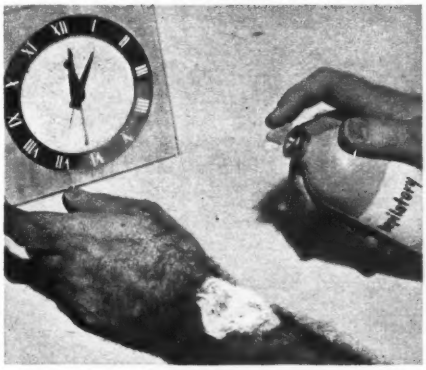
One aerosol packager now has come up with a formula that promises to remove nearly all restrictions. It is called Polysol, developed by the Connecticut Chemical Research Corporation (Conn-Chem) of Bridgeport. The firm's president, A. O. Samuels, sees vast potentials for his new method.

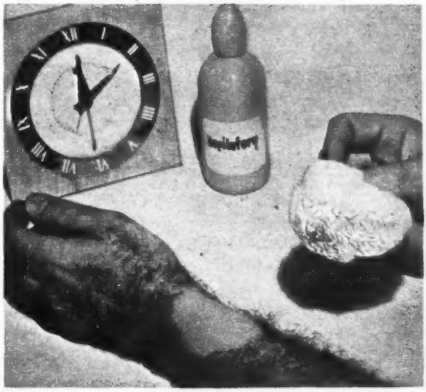
"The impact will be felt all through industry and on the consumer level," he says. "It increases the possibilities of pressure packing better than tenfold."

Polysol is basically a concept of new propellants—inert gases like helium, neon, argon, nitrous oxide, carbon dioxide, butane, propane and krypton.

Probably the most startling potential of Polysols is in the foods line, long eyed hungrily by the aerosol crowd.

Polysol talcum, suspended in liquid gas in the bottle, arrives on wrist dry and light.





Conn-Chem already has produced experimental cans of peanut butter, cheese spread, mustard and catsup. Polysol gases are safe for use with foods and do not alter flavor or texture, the main requirements for public acceptance. At a press luncheon a few months ago Conn-Chem demonstrated a dry, dry martini—a whiff of vermouth sprayed on a glass of gin.

Any food that can be made into cream or liquid can be dispensed from Polysol bottles. The first to reach retail shelves, possibly in one to two years, probably will be mayonnaise, syrups, vinegar, cooking oils, salad dressings, sauces and mustard and catsup. Creamed vegetables like spinach, strained baby foods, even mashed potatoes are possible. The knife of practicality eventually falls, of course. Potatoes will probably always be too cheap for a costly dispenser.

The first Polysols are to hit the market this spring. In the van will be a depilatory. Hair-removers heretofore have had a limited market because they are hard to use and have an unpleasant odor. The Polysol product has a pleasant scent and is easy to apply. In five years, Samuels believes, a whisker-remover to eliminate shaving for men will be on the market.

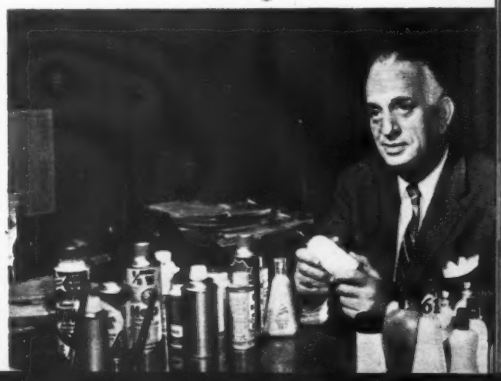
A mouth wash and throat spray likely will be No. 2, followed by body rubs, eyewashes, anti-perspirants, personal and household disinfectants, cosmetics, pharmaceuticals, toothpaste and even some solids such as talcum.

Even before the Polysol concept, aerosolers foresaw a 600,000,000-unit year for 1960. How far can it go?

"I frankly don't know," says Samuels. "Probably just as far as your imagination can take you." •

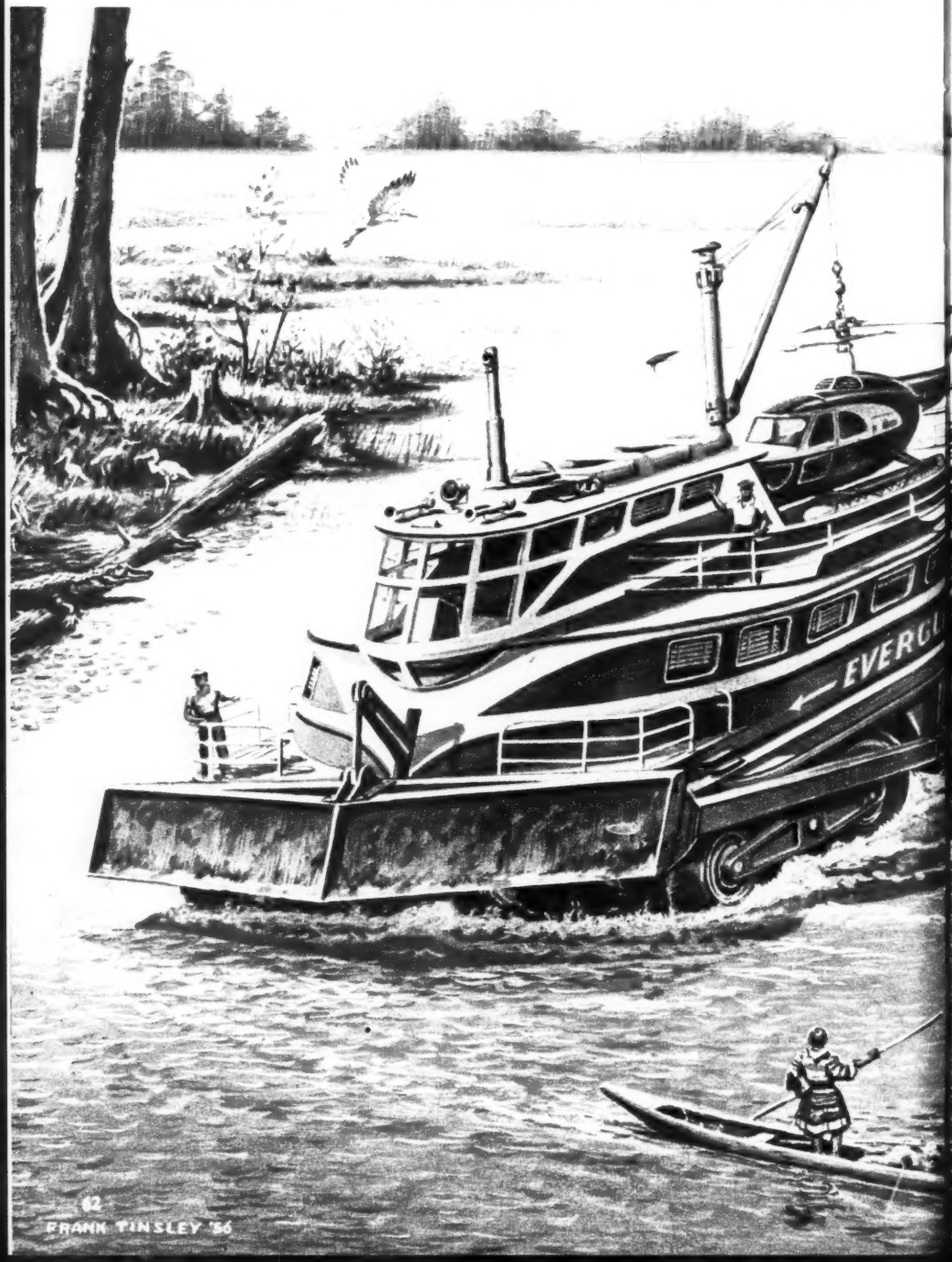
Depilatory is among several lotions which now can be marketed in squirt bottles for the first time. Product shown above does a thorough job of removing hair in just ten minutes.

Aerosol packer A. O. Samuels shows Polysol products in unmarked bottles.

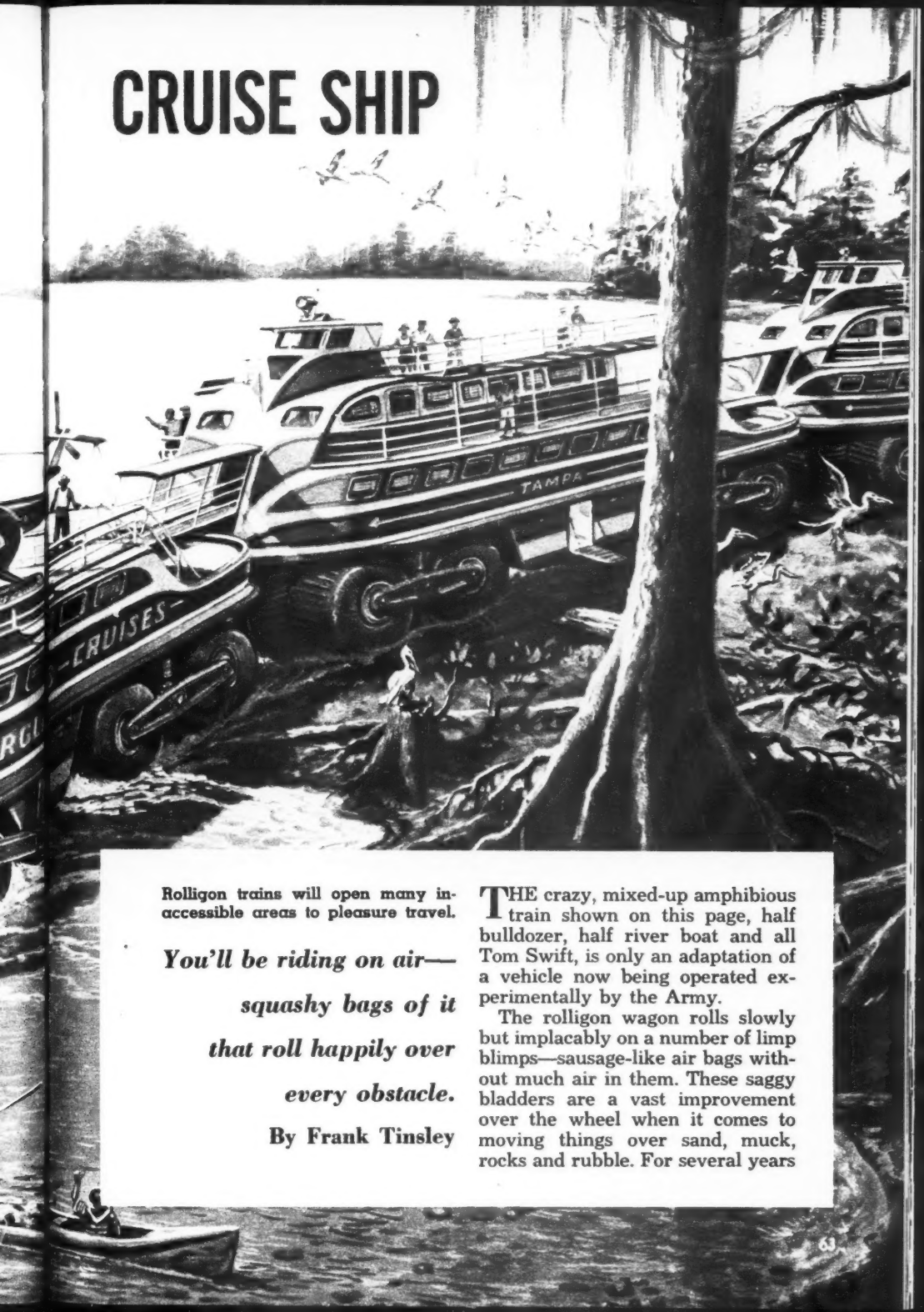


AMAZING
MARVELS
OF TOMORROW

CROSS-COUNTRY



CRUISE SHIP



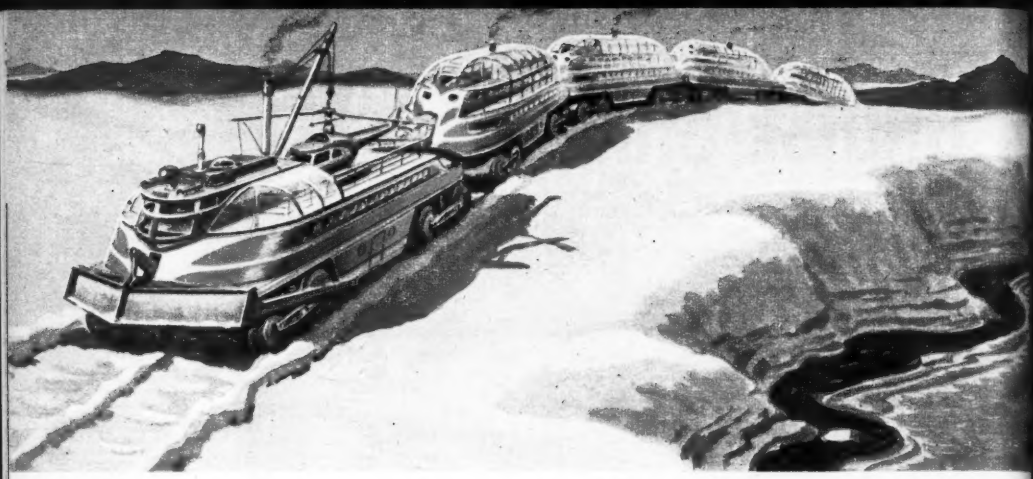
Rolligon trains will open many inaccessible areas to pleasure travel.

You'll be riding on air—squashy bags of it that roll happily over every obstacle.

By Frank Tinsley

THE crazy, mixed-up amphibious train shown on this page, half bulldozer, half river boat and all Tom Swift, is only an adaptation of a vehicle now being operated experimentally by the Army.

The rolligon wagon rolls slowly but implacably on a number of limp blimps—sausage-like air bags without much air in them. These saggy bladders are a vast improvement over the wheel when it comes to moving things over sand, muck, rocks and rubble. For several years



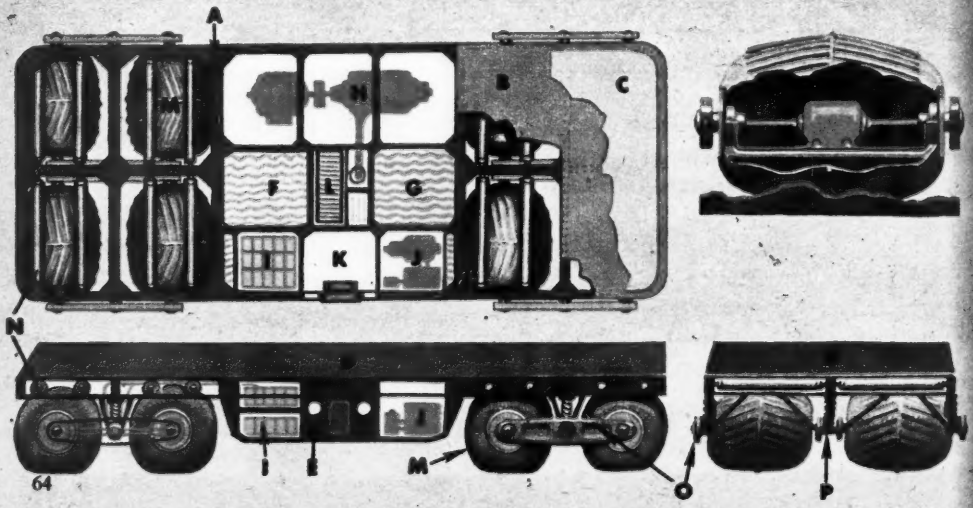
Superstructure modifications make the cruiser perfect for traversing arctic or desert

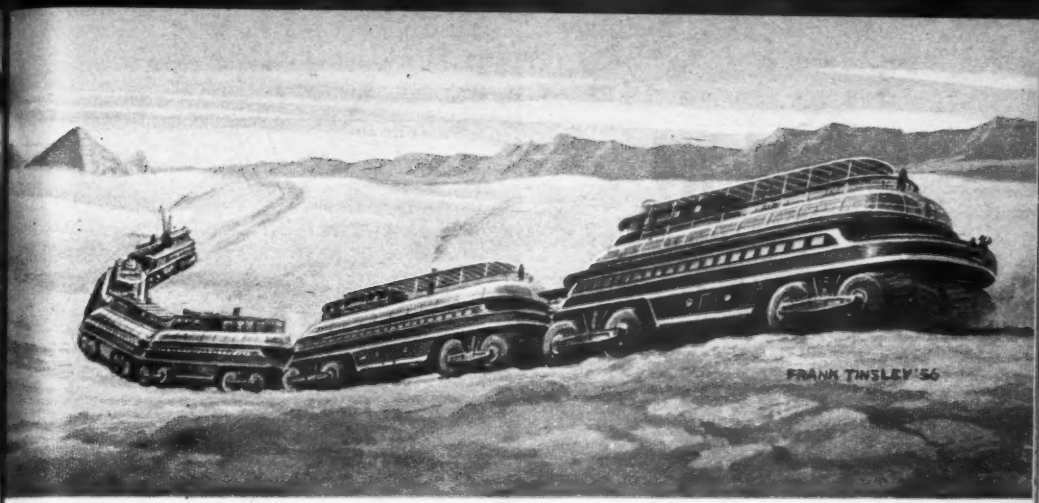
the boating public has been using low-pressure rollers for moving boats on every type of ground.

Rig your rowboat so that it rolls *with* the air bags instead of *over* them, put in some kind of power plant and you have a rolligon vehicle. The Army has done this; in fact, it has put a five-ton truck on rolligons and driven it where tractors fear to tread. Not only can you drive it easily over a field of king-size rocks but where other vehicles sink to the hub caps, this one rolls over muddy terrain with ponderous aplomb. The air bags spread the load so evenly you can drive your five-ton job over a bevy of sun-bathers with no more than appreciative grunts from the victims: servicemen and women who have tried it say it's like a nice, beefy massage.

The rolligon was made available to modern surface transport by an ex-mission school teacher named William H. Albee who learned about it from the

Below, details of MI's cross-country rolligon cruiser: A. Chassis; B. Watertight steel deck; C. Cork flooring; D. Watertight hull; E. Engine room; F. Water tank; G. Fuel tank; H. Diesel generator; I. Battery room; J. Air conditioning; K. Entry; L. Hinged staircase; M. Rolligons; N. Frame supporting rollers; O. Rolligon positioning arms; P. Tripod rolligon arm supports.





wastes. It could be plastic-canopied for polar sun bathing, air-cooled for the Sahara.

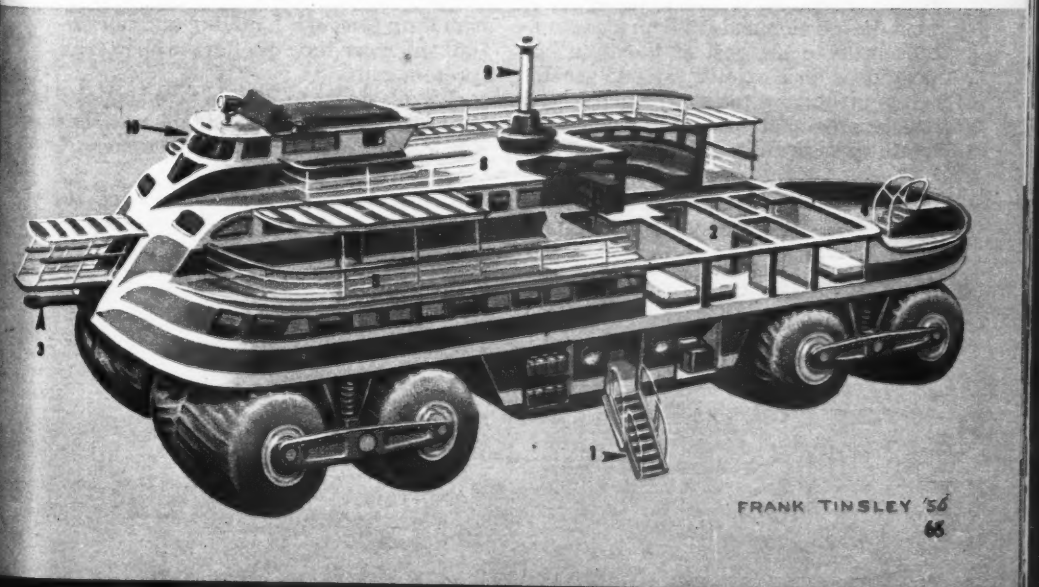
Eskimos. Albee's stone-age students up on the Bering Strait use inflated sealskins to overland their big umiaks—medium-sized barges covered with skins and often loaded with five tons or more of walrus meat.

In the accompanying illustrations MI has tried to visualize a modern use of Albee's concept for you. Basically, the machine is an amphibious, off-the-road weight carrier, with a shallow, barge-like chassis and a central, underslung power compartment.

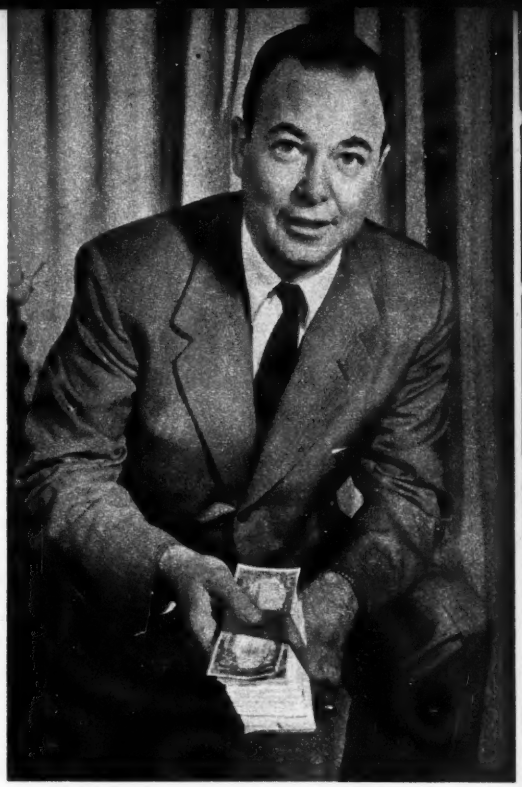
In this MI design, an electric drive has been selected, with motors mounted inside the rolligon hubs. Current is produced by a diesel generator unit in the watertight power compartment.

This is MI's concept of a rolligon cruise ship. Whatever form the rolligon eventually takes, there can be little doubt that Bill Albee's squashy, Eskimo air-bags have provided mankind with a radically new form of transportation. •

Below, cutaway view of passenger cruiser: 1. Entry: steps retract into watertight deck; 2. Lower deck: gangway and staterooms; 3. Gangway and coupling; 4. Afterdeck, gangway steps; 5. Promenade deck; 6. Upper staterooms opening on promenade deck; 7. Lounge and bars; 8. Sun deck; 9. Air intake, diesel exhaust stack; 10. Pilot house, crew quarters, stairs.



Just design a practical toothpaste tube cap and the dough is all yours!



Got any good ideas for a captive cap? If you do, Victor Muscat has $5,000 for you.

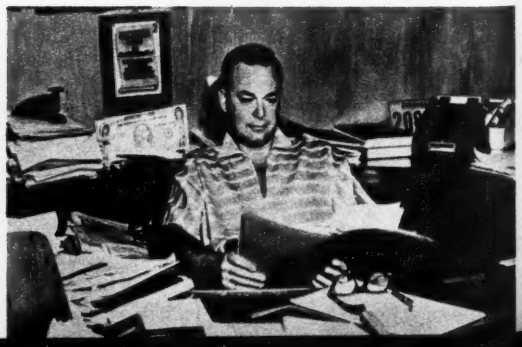
VICTOR MUSCAT, president of Victor Metal Products, largest manufacturer of collapsible toothpaste tubes, offers to pay $5,000 to anyone who can come up with a practical, inexpensive and attractive "captive cap" tube.

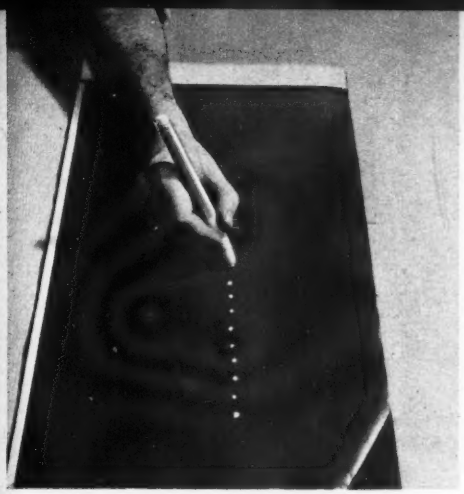
The cap must be simple to make and be permanently attached to the tube. It must be economical—the present one adds little to the cost of the tube but most ideas for a captive cap add greatly to manufacturing costs. Hinge or chain attachments that have been suggested create an assembly problem. The cap must not be too big or bulky for the tube carton. It must be easy for the consumer to use and not involve fancy or intricate movable parts that would break. It must be sturdy and able to stand up to rough handling and not entail any more time or effort to open than present caps.

It boils down to quite a problem, eh? Got any $5,000 ideas? Send them to Victor Muscat. He'll be glad to see them. •

Muscat conducts his business at home. Here his wife prepares refreshment for a guest.

Muscat examines ideas which can be sent to him at Sherwood Avenue, Greenwich, Conn.





This Month's
BRIGHT IDEA

Hold pen upright and lightly press point on surface to be stuck and the job is done.

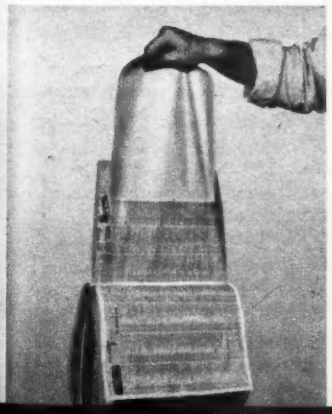
PRESTO-PASTER

WIN $50

MI will award $50 each month to the first person who tells us of a new and useful gadget that is patented and in production. Manufacturers are also eligible for this award. Pictures and a description should be sent to Bright Ideas Editor, Mechanix Illustrated, 67 West 44th Street, New York 36, N. Y.

STICK-STUCK Presto Paster is a pen that dispenses gum dots instead of ink—about 4,000 blobs at one filling, according to the maker. These gum dots are unbelievably strong and can be used for sticking labels on jars, holding a file of papers together (one dot on corner of each page does the trick) and sealing small packages—plus a host of other office or household uses. The gum dot dries and sticks instantly. This unique pen costs $1; refills are available. It is distributed by Leocel Products Co., 33 Union Square, New York, N. Y. •

Single sheet of paper gummed with pen is strong enough to support heavy telephone book.

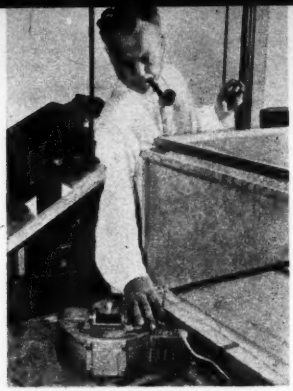


Four dots placed in each corner of photo will firmly fasten it in family picture album.

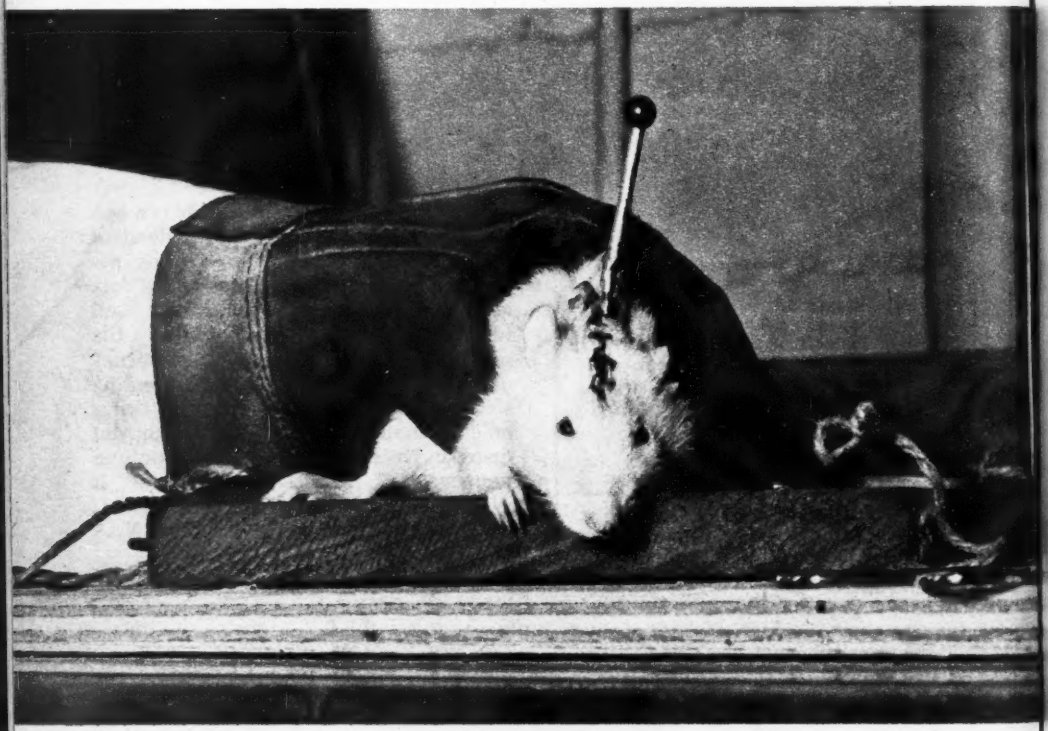
One dot quickly dabbed in the corners of papers will hold a file of them neatly together.

Radio-Controlled Rats

Rodents with radio sets in their heads get their brains massaged by electric impulses for science.

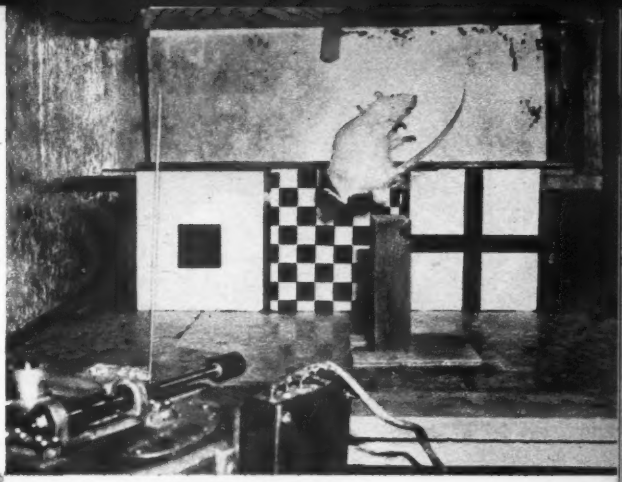


Dr. Gengerelli throws switch that sends electric impulse to the brain of a rodent.



Antenna in rat's head picks up signal. A smaller one is used for more active tests.

Here Dr. Gengerelli inserts receiving antenna in tiny socket of rat's head. Insertion doesn't hurt rat.



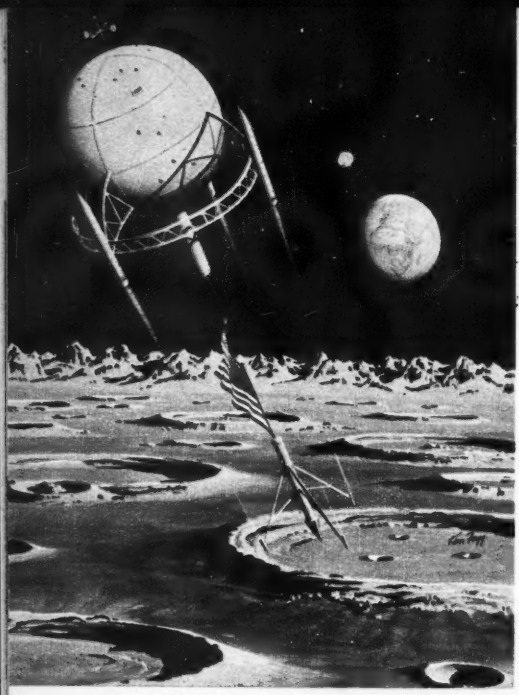
Radio signal causes minor convulsion if rodent heads for the wrong door, as shown in this experiment.

Magnified many times, this is the tiny radio set buried in rat's head. It receives very high frequencies.

INSERTING a miniature crystal set beneath the skin of a rat's head, Dr. Joseph A. Gengerelli, Professor of Psychology at the University of California, has been doing research on the subject of instructing rats by radio. With the aid of high frequency broadcasts, a rat can be taught to open one of three swinging doors. The radio signals cause minor convulsions in the rodent's muscles and it learns to open the right door if rewarded with food. The tiny radio set in the rat's head weighs only two oz. and is connected to the brain by an almost invisible fine wire. Experiments are designed to provide knowledge which can be applied in the treatment of insane persons through electric shock therapy. •

After many tries, rat learns to open door which has the food behind it—his reward.

Dr. Gengerelli determines to what extent signals retard rat's speed at getting chow.



LET'S CLAIM

We can beat the Reds with this plan for shooting our flag to the Moon by rocket.

By Pierre J. Huss

THE RUSSIANS, by their own admission, are getting ready to claim possession of the Moon. By 1970, judging from known Soviet plans for shooting rockets into the skies, the Moon will become sovereign territory of the Soviet Union—a "suburb" of Moscow.

Obviously, then, *now* is the time for

Last stage of rocket fires staffed flag which is set firmly on moon's surface.

THE MOON—NOW! COVER STORY

us to stake out our claim to the Moon if the interests of free mankind are to be safeguarded for future generations. Otherwise, the Russians will beat us to the punch by grabbing first and talking afterward.

American ingenuity and enterprise and our scientific and technical know-how should be mobilized into a giant effort to overcome the obstacles and give the U. S. the honor and glory of staking out a claim to the Moon by planting the Stars and Stripes on lunar ranges and valleys via rockets!

The Moon is so great a prize in shaping principles concerning space and interplanetary rights that now is the time for the U. S. Government to act boldly. Congress should issue an immediate proclamation establishing jurisdiction over the Moon by right of first contact. The flag could follow as the clincher.

The first contact—and even the Russians haven't claimed this—was made with the Moon by the United States Army Signal Corps on January 10, 1946. Lieutenant Colonel John H. DeWitt made the historic contact by radar at Evans Signal Laboratory, Belmar, N. J. The powerful radio impulse shot at the Moon echoed back in two and one-half seconds, a round-trip of 477,000 miles. Here, then, is the first legal basis on which the United States Government can pin a technical claim of jurisdiction.

With the right of jurisdiction established, the U. S. Army Signal Corps, or any other interested governmental

International law recognizes ownership claim after nation's flag has been established.

branch, should be assigned by Congressional mandate to create a continuous pattern of contacts with the Moon by radar, giving out regularly prepared reports on the lunar areas at which the contact took place, and the exact time and duration of the response. Surely our international law experts could base a valid ownership claim from this consistent contact with the Moon.

But there is talk in diplomatic circles that the Russians are getting ready to argue—once they get a firm start on their Moon project—that insofar as both terrestrial and celestial properties are concerned, possession is the only basis for a claim of ownership. That contention probably will hold good if put to the test, especially if Soviet weapons and military positions appear on the Moon before the U. S. is able to transport human beings to our nearest neighbor in the skies.

It must be stressed here that while possession is nine-tenths of the law, the landing of men on the Moon to claim that barren but strategically important satellite is *not* necessary to establish possession. Columbus stuck the Spanish flag into the sands of a West Indies beach—and we or the Russians would be perfectly within the concept of international law to claim possession of the Moon by shooting our national flag there by rocket.

"Now is the time for us to stake out our claim to the Moon if the interests of free mankind are to be safeguarded . . . Otherwise, the Reds will beat us to the punch!"

It has been said by leading American rocket specialists that, given a billion dollars to finance a Moon project, an attempt to shoot radio-controlled missiles up there could be made within a comparatively short time. On that basis, what is wrong with collecting a billion-dollar fund by voluntary contributions from hundreds of our great industrial concerns, with each dollar collected to be matched by an equal amount from the government? There are rocket experts in the United States who say that with such a gigantic and concentrated effort, we could shoot the Stars and Stripes to the Moon before the Russians get off the ground.

Back in 1946, when the U. S. Army disclosed it had bounced radar signals off the Moon and raised hopes that a rocket might be shot up to the satellite within a few years, the Soviet delegate to the U. N. got panicky (during the Assembly's September session) and hastily called a meeting of his Red colleagues. Dmitri Manuilsky, a shaggy old man from the Ukraine and a real power in the Stalinist regime, proposed and drafted for approval by Moscow a resolution declaring the Moon subject to U. N. trusteeship. The purpose was not directed at safeguarding the interests of mankind. It was to thwart any claim to territorial possession of the Moon by the U. S. Manuilsky, hopped-up by the U. S. disclosure of contact with the Moon some months earlier, naturally feared that the United States was on its way to space travel and would beat Russia to the Moon.

Moscow considered the idea of introducing such a resolution for some weeks. Eventually, after closely studying reports of Red agents on American capabilities of reaching the Moon by manned and unmanned rockets, Moscow cooled Manuilsky down. Today, the shoe seems to be on the other foot. All available evidence leaking out from behind the Iron Curtain points to the fact that the Russians may win the race unless the U. S. gives top priority to claiming the Moon as the guardian of mankind's interests.

U. S. Secretary of State John Foster Dulles, although hemmed in by international diplo- [*Continued on page* 160]

Son of the maker of the 12-foot multiple clock points to half-hour gong.

Clock With a Brain

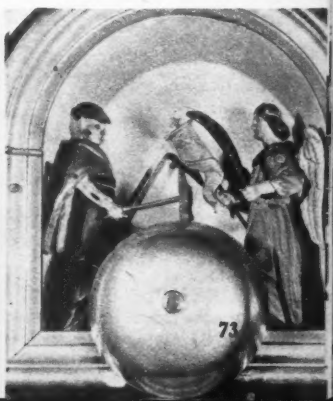
THE world's most wonderful example of old-fashioned German novelty clockmaking is on display in the tiny shop in Heidelberg where its maker, Michael Waltz, spent 39 years building his masterpiece. Now in the possession of his sons, to whom he imparted the secret of its workings, it is one of the town's tourist attractions.

Besides the features shown in the pictures, the clock has a night watchman who blows a horn, a cock that crows at dawn. The clock celebrates Christmas, Easter, the seasons, the signs of the Zodiac. Back in the Nazi era Dr. Goebbels, Hitler's propaganda man, asked Waltz to turn the 12 Apostles into 12 Storm Troopers. Waltz said no. •

St. Joan shares a niche with one of the many bells. All the figures are hand carvings.

Figures of Christ and Apostles, which celebrate the hours, get a thorough, careful cleaning.

Blacksmith Death tolls passing of each hour on his anvil under an angel's watchful eye.



TUBSIDE PHONE with non-shock on-off switch and a loudspeaker-type receiver—no hands. Peter Pessa, Philadelphia, Pa.

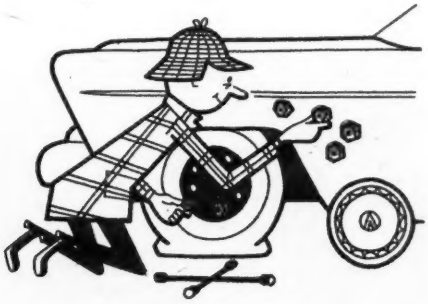
PUSH DOORKNOB you can elbow open when you bring home the weekly groceries. Robert Weaver, Oklahoma City, Okla.

INVENTIONS WANTED!

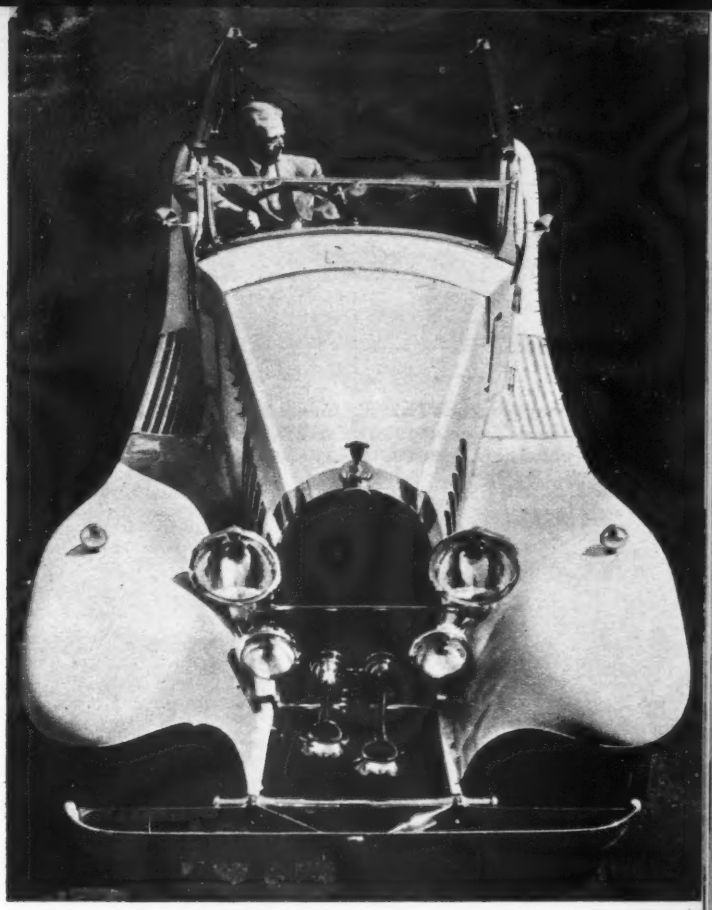
Is there a gadget you think should be invented? If so, send its description to Inventions Wanted Editor, MECHANIX ILLUSTRATED, 67 West 44th St., N.Y. 36, N.Y. Each one printed will be awarded $5.

CAMERA KITS for home assembly by low-budget shutterbugs who want good cameras. Richard Slazinski, Pittsburgh, Pa.

LUMINOUS STICKERS to fit over keyholes, make those late homecomings much easier and quieter. R. F. Brentano, Harrison, N. Y.



MAGNETIZED LUGS that would stick to the fender during emergency wheel changes. Charles Bucher, Waynesville, O.



Charles A. Chayne, GM vice president in charge of Engineering, at the wheel of his Bugatti Royale, type 41. Only seven of these big cars were ever built.

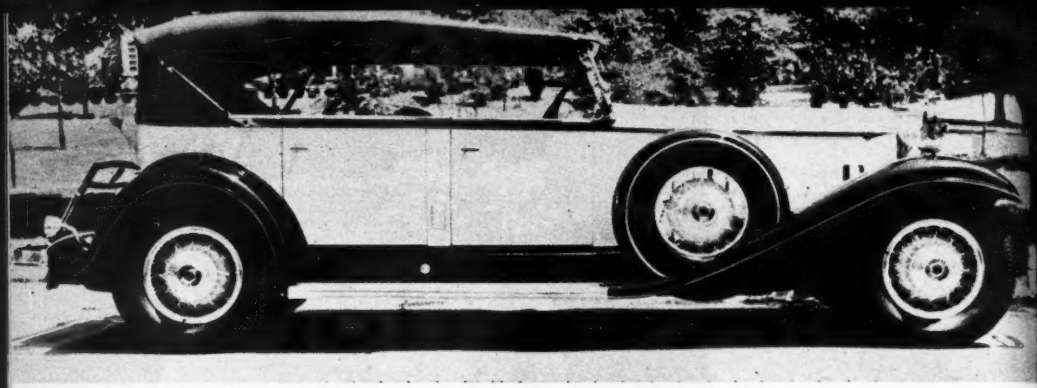
World's Largest Cars

Detroit still has a long way to go to catch up in size to some of the huge cars built in the past.

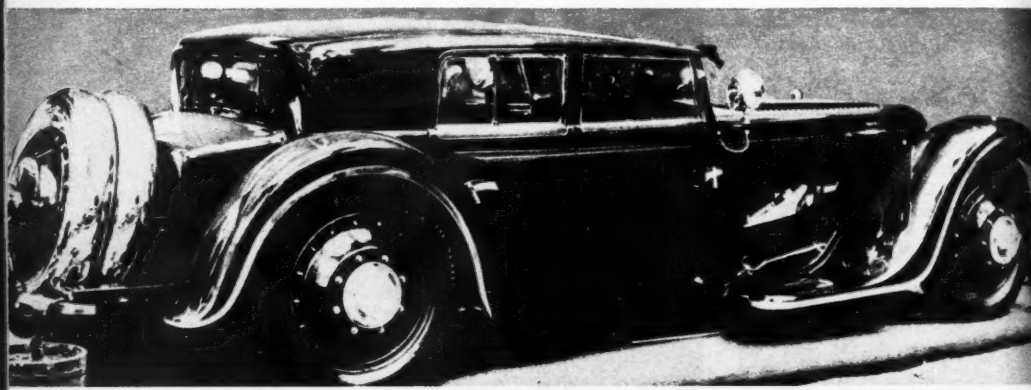
IF YOU think the current crop of autos emerging from Detroit is big in size, you have only to look back at some of the earlier motor vehicles which assumed truly large proportions.

As far back as 1908 a vehicle named the State Motor Coach had a 17-foot length and a huge 153.5-inch wheelbase.

Beautiful Chrysler phaeton is one of three such cars designed to carry notables at special events. Car is hand-styled and hand-built, is over 20 ft. in length.

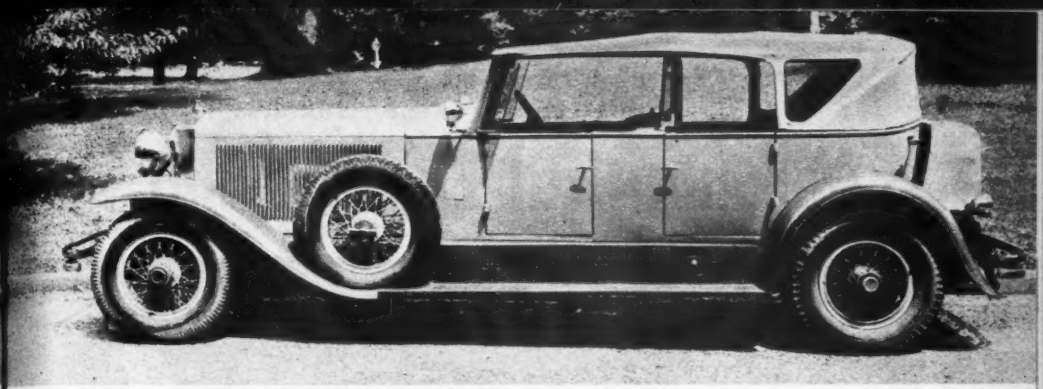


Racy Packard Twin-Six model 905, vintage 1932, had a 142-in. wheelbase and a beefy V12 engine with a 3 7/16-in. bore and a 4-in. stroke. Car's piston displacement was 445 cubic inches and engine developed claimed 160 horsepower.

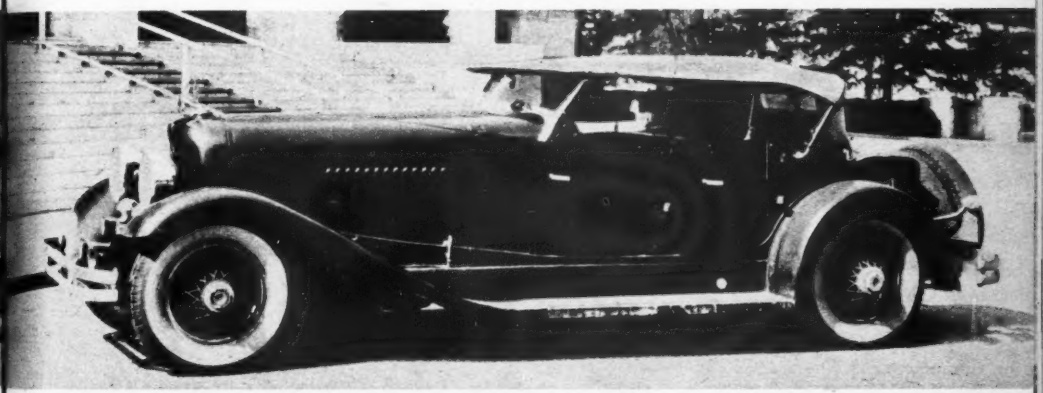


Low slung Bucciali was first shown in the 1930 Paris Salon. Powered by a 51-horsepower 22-degree V16 engine, Bucciali was probably largest private car made with front wheel drive. Wheelbase is not known but tires were 6.75x36.

Austere 1936 Rolls-Royce Phantom III is owned by Major John J. Macken, Ft. Eustis, Va. Four-door town car cost an estimated $17,000 new. Wheelbase is 142.5 in. It has all-aluminum body and fenders and is a "one of a kind" car.



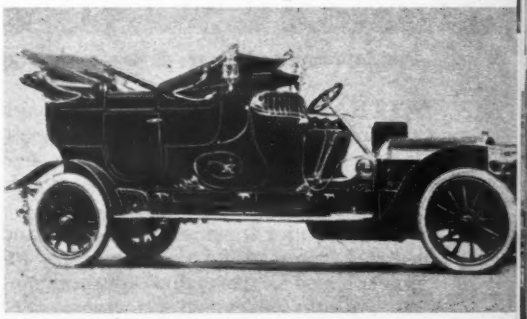
Doble auto of 1925 had four-cylinder compound steam engine bolted to differential housing of rear axle. Flash boiler is located under hood. Car has an enormous wheelbase of more than 150 in. William Belser of California owns it.



Sporty 1931 du Pont Model H, the last of the famous du Pont sports cars. This snappy job had a straight 8 engine with a 320-cubic-in. displacement. Wheelbase was a long 145 in. It was popular with sports car fraternity of '30s.

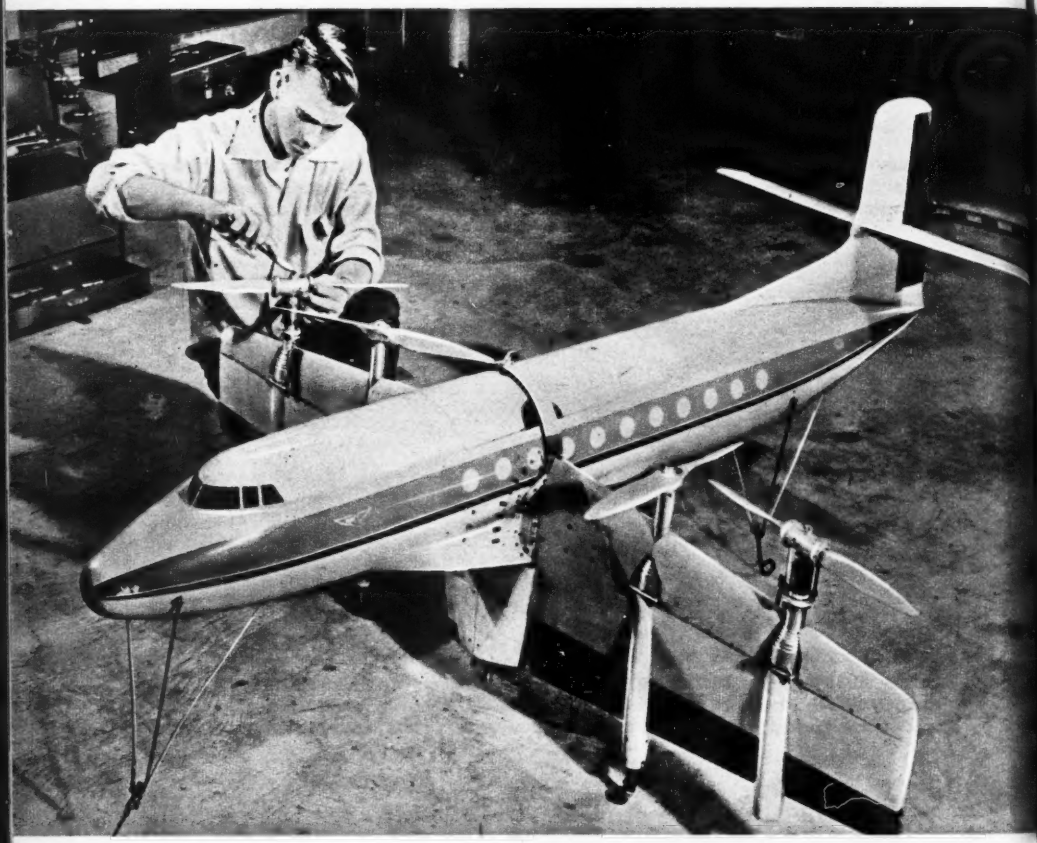
Compare this with the 1957 Chrysler which is considered a big car today. Its wheelbase is a mere 126 inches. The latest Chrysler phaeton with its plus 20-foot length and 147.5-inch wheelbase is one of the few cars that matches its predecessors in size.

In the roaring '20s the Packard Twin-Six model 905 with a V12 engine and 142-inch wheelbase satisfied the yen of those who liked them big. The '30s saw such powerhouses as the 16-cylinder engine of the Bucciali and the austere length of the $17,000 Rolls-Royce Phantom III. Detroit still has a long way to go to catch up in size to these behemoths of the past. •



Princely State Motor Coach of 1908 was mounted on 20-25 horsepower Fiat chassis, belonged to Maharajah Scindia of India.

Your Career in Aeronautical Engineering



Development engineers devise such craft as this tilt-wing transport now being tested.

WHAT does an aeronautical engineer do? What are his problems, how bright is the future and what is the pay? How do *you* get to be one?

In search for the answers to these and other key questions about aviation engineering as a career, this reporter spent many weeks interviewing a wide variety of experts. He consulted aircraft plant bosses, hiring officials, educators and working engineers themselves. What follows is a composite conversation with these men that will answer all your questions.

Just what is an aeronautical engineer?

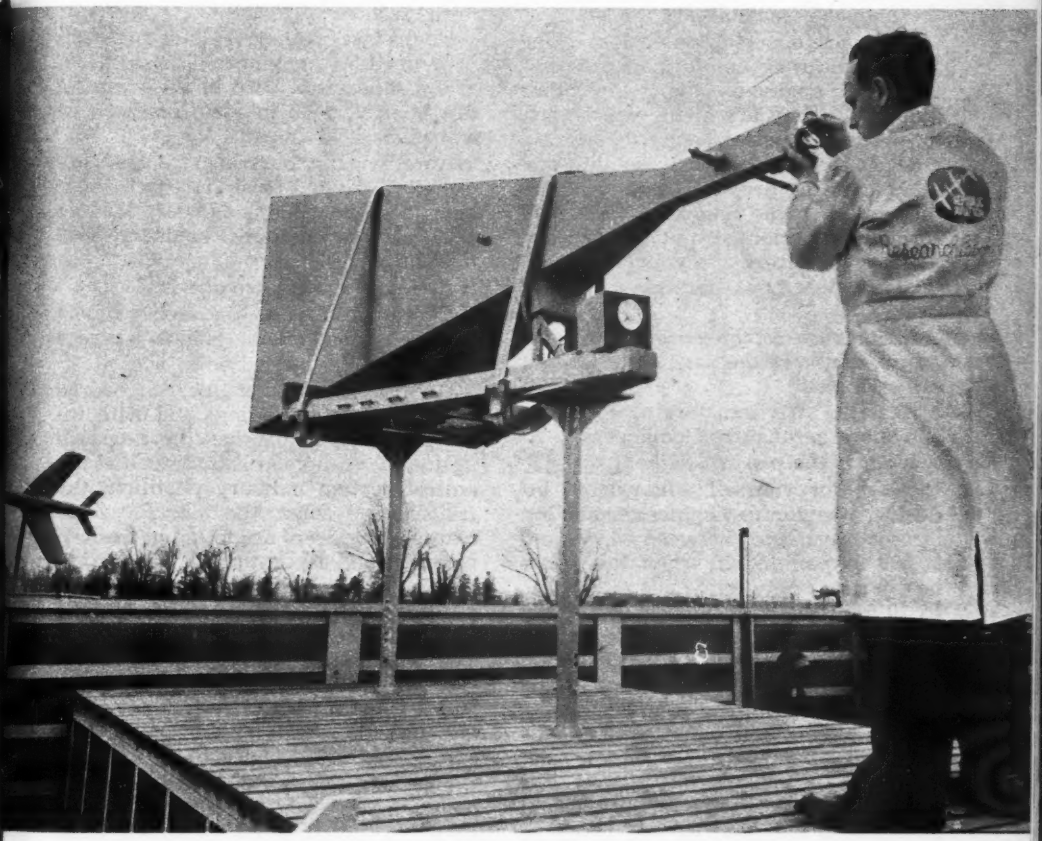
He's the fellow who designs, manufactures and maintains airplanes, engines and instruments, and the equipment required in all types of air operations.

Suppose I'm a young guy and want to become an aeronautical engineer. Do I stand a chance?

Darned right you do. Let's start out

There is no place to go but up in this industry which literally is searching for qualified men.

By Lester David



Research model never flies but helps engineers place radio antennas for best reception.

with a really inspiring success story.

It's about a young fellow who was graduated from high school in New York City and went to work as an aircraft engine mechanic in Massachusetts. Now this chap didn't want to stay in that job the rest of his life but he had no opportunity to get a formal education.

So he did the next best thing. As he told a New York Times reporter many years later: "I took all the correspondence courses and read all the textbooks."

Studying in his spare time paid off. This fellow became a topnotch engineer, head of a great firm and, as The Times went on to say: "Many a graduate of MIT has made no better mark in engineering."

His name? Roy T. Hurley, chairman and president of Curtiss-Wright Corp., one of the world's largest and best known producers of aircraft engines and equipment.

Well, that was some years ago. Can young men who don't have the oppor-

tunity to attend college still make the grade today?

Unquestionably they can. Many hundreds, even thousands, have done so and many others will.

How about some specific information on aeronautical engineering itself. Is there much opportunity in the field?

There are opportunities galore. The aircraft industry employs more scientists and engineers than any other industry. They are being called upon to produce nuclear-powered aircraft, guided missiles, the earth satellite and other amazing projects literally out of this world. Igor Sikorsky, the noted aeronautical scientist, put it this way: "Today, the future of a young aeronautical engineer is as limitless as the air itself."

In other words, the more the industry grows, the more the need for engineering personnel?

Exactly. We are starving for more and more aeronautical engineers.

What is the pay scale like?

Judge for yourself. In private industry, a beginning engineer smack out of school can earn between $4,000 and $5,000 a year and in about five years he can rise to between $7,500 and $9,000. In 10 to 15 years, if he rises to the top rung in his branch, he can expect about $20,000 or more annually.

The Institute of the Aeronautical Sciences disclosed the salary range in the profession following an intensive study all over the U. S. Take a good look. These are monthly figures and the salaries given are base pay and do not include bonuses, cost of living or other adjustments. Here are a few:

Armament engineers: Chief engineer, $675 to $1,000; engineer, $350 to $700.

Design engineers: Chief engineer, $750 to $1,600; chief preliminary design engineer, $800 to $1,600; group supervisor, $650 to $1,000.

Flight test engineer: Chief engineer, $800 to $1,500; engineer, $350 to $700; group supervisor, $600 to $900; missile test analyst, $400 to $750; research or test pilot, $700 and up.

Aerodynamic engineer: Chief engineer, $750 to $1,500; research engineer, $500 to $800; engineer, $350 to $700; chief wind tunnel engineer, $600 to $900.

How are working conditions?

The Institute for Research's report on aeronautical engineering as a career says:

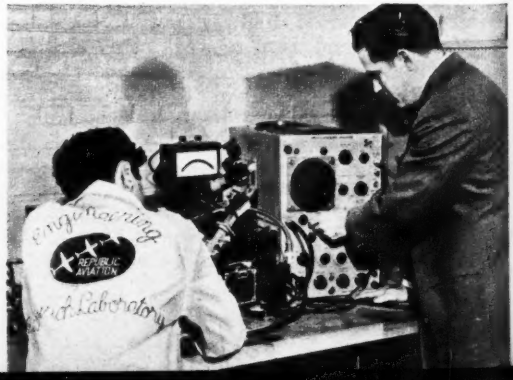
"The aeronautical engineer . . . works in pleasant surroundings and with intelligent people and has the latest in up-to-date equipment. Inasmuch as the entire aviation industry is still in the trail-blazing stage, the jobs for aeronautical engineers are found in modern factories and laboratories. Most companies in the industry operate under policies known to be favorable to good industrial relations. Paid vacations, sick leave, standardized job classifications, periodic merit reviews, group insurance and attractive retirement plans are the rule.

I understand that, just like the planes themselves, the aeronautical engineer comes in different models. What are they? [*Continued on page* 159]

Pre-flight check by engineers, maintenance men helps keep F-84F Thunderstreak flying.

Republic Aviation Photos

Electrical control system for jet fighter gets once-over before it's used in plane.



Jack Bouck, whose recipe for barbecue ribs started a bonanza, checks the meat in the eight-foot refrigerator he and his partner constructed from how-to plans.

THEY GOT RICH ON RIBS

These lads knew from nothing about running a rib joint—but man, that barbecue sauce!

By Eda Johnstone

NEVER heard of Kelbo's? Guess you haven't been in L.A. lately. It's one of the biggest success stories out there since Mr. Goldwyn quit the shoestring business.

Kelbo's Hawaiian Barbecue opened with a bang six years ago. Beginning as a small roadside stand, it has now branched out as Kelbo's Kar-B-Q and Kelbo's Fairfax, which in the interval have served hundreds of thousands of customers from all over the world.

Kelbo's guest book is filled with names from New York, England, Switzerland,

West Coast announcer Al Jarvis is one of many celebrities who keep coming back to gnaw on those habit-forming ribs. Victor Mature is another regular.

Shanghai, Alaska and Honolulu. Lord Denbigh, an English milord, wrote "Jolly place." A New Jersey patron wrote, "I traveled 3,000 miles to get a good meal." The late Susan Peters was a regular customer and the only one to receive car service before the Kar-B-Q was built. Other movie stars are regular patrons. Nowadays when a West Los Angeles businessman wants to take a client to lunch, he takes him to Kelbo's.

All this developed because Jack Bouck, an ex-musician working in a shipyard, knew the secret of barbecued ribs and roasts. Neither he nor his partner Tom Kelley knew beans about running a beanery. Jack and Tom went blindly into a business venture with only a recipe and ran head-on into success.

As a youngster, Jack joined a professional band engaged by the Dollar Steamship line. In restaurants in Hong Kong, Shanghai, Manila and Honolulu Jack was impressed by the quality of the barbecued ribs and roasts. On his free time he visited the kitchens and made friends with the Chinese chefs. There he learned the secret of barbecued ribs, roasts and sauces.

In World War II, after a hitch in the Marines, Jack got a job at the San Pedro shipyards where he met Tom Kelley.

In a shipyard you get sick of sandwiches. While Jack and Tom were griping one day Jack said, "You and your wife come over to the apartment and I'll cook you the best barbecued dinner you ever ate."

"To make a long story short," Tom relates, "when I finished the barbecued ribs, yams, and pineapple, they had to walk me around the block four times!"

Tom was sold. "Bouck, we're going into business."

They pooled their savings—$250 each. They spent their time off searching for a suitable location. The corner at Exposition, Gateway and Pico boulevards in West Los Angeles looked good.

They bought an old Army barrack for $155. Two hours daily, before going to the shipyard, they worked dismantling it, hauling the material to their site. They decided to begin with the refrigerator. They studied books and how-to articles in magazines and squared that away.

The barbecue pit was next on the program. They found that an old brick building at the Veterans Hospital in Sawtelle, two miles away, was being razed. They bought one wall for eight dollars, knocked it down, cleaned the brick, and hauled it away themselves. When the novice bricklayers had finished the pit their nest egg was exhausted. To earn more money they contracted for Sunday work installing safes in markets and other businesses. When they had established another small fund they went on with their building.

"It was a wonder," Jack said, "that the neighborhood didn't circulate a pe-

Regular Sunday opening time is 4 p.m. but the line starts a full hour earlier.

Kelbo's is friendly, informal; Al Jarvis jives with the boys as he worries a rib.

tition against us, we were so long finishing the thing."

Opening night was 18 months after starting the project. For months a sign in front had proclaimed, "Kelbo's Hawaiian Barbecue Opening Soon—It Says Here." By that time they were really broke. They had to borrow $50 for cash register change. And having gone into it so far, they hired an Hawaiian string orchestra to play outside.

A huge spotlight shuttled across the sky. Opening hour was to be at eight p. m. Late in the afternoon all was in readiness—gallons of salad, the pit filled with meat and yams.

When Jack returned at seven o'clock he was astonished to see lines of people. Cars were double parked; police directed traffic. When the doors opened the crowds jammed the place. Orders started piling up when they discovered that coffee had not been made. The French Fry cutter broke down and the potatoes had to be cut by hand. They worked so hard and fast that they never did hear the music outside. Periodically they bolted into the refrigerator to cool off. And they just stared at each other, bug-eyed. They had cut fingers, burned hands and arms, and still the crowds came. Some of the customers stood in line from eight o'clock until eleven. The boys had to close the place at one a. m. because their food ran out.

When the last customer had left, Tom and Jack dropped exhausted onto a bench, "Where did they all come from?" gasped Tom.

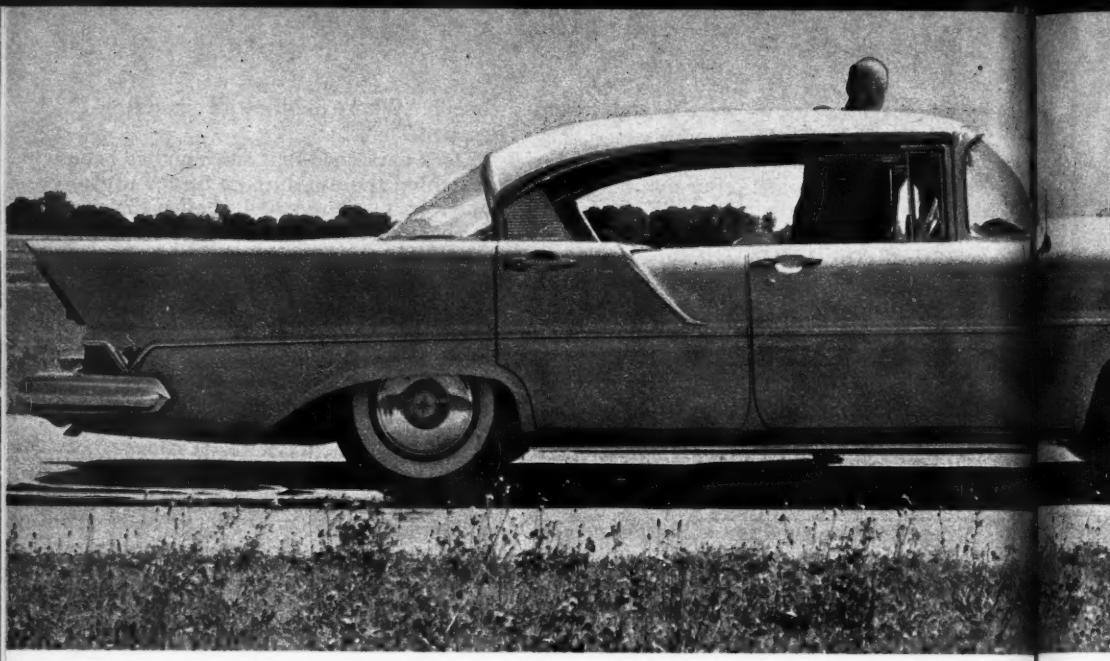
Jack explained that one man had been watching the building go up for a year and a half. Others had smelled the ribs barbecuing all day.

It was many months before the boys had more than four or five hours sleep each night. They did their own dishwashing, and after the last patron left at 1:30 in the morning, preparations were made for the following day—ribs and roasts into the barbecue, salad to make, pineapple to slice, working until five a. m., then back again to open up at eleven for lunch. In the first year of operation they grossed a quarter of a million dollars!

In 15 months they had 13 employees, serving 2,300 customers each week, added the Kar-B-Q, enlarged the pit and built the Fairfax place opposite Gilmore Stadium. And the feverish pace of that opening night has never let up. Once they opened their doors, success hit the boys like a tidal wave. Neither is complaining—not seriously, anyway. For anyone who wants to copy them they have some advice. First, find your magic recipe. Second, learn *something* about business management. If they'd done that, the boys say, they'd have saved the first two or three fortunes they made in ribs. As the first tip is the toughie, maybe you'd better learn about management first—you can always use this basic knowledge. •

Bandleader Harry Owens and singer Hilo Hattie conk out after a snack at Kelbo's.

June Kelley and Betty Bouck, wives of the owners, lend a hand with the decorating.



The '57

Superb roadability plus terrific 300-hp white-tie-and-tails car as has been built to date,"

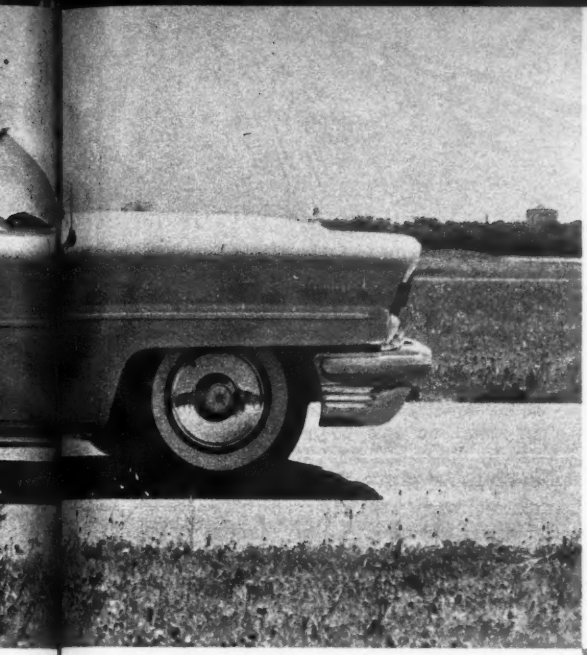
By Tom McCahill

BACK in 1953, Lincoln swapped its stovepipe hat for a beanie and gobbled up all comers in the 1,900-mile Pan-American road race. The next year they did it again, as hundreds of little Mexican boys screamed out to the rest of the competition, "They went that a-way, senor!"

One thing about the Ford organization (which includes the Continental, Lincoln, Mercury, Ford and next year the Edsel) is that these boys are not set in their ways. With their Mexican successes behind them—successes which were accomplished because their cars not only were fast but roadable and the finest-handling automobiles ever produced in this country—Lincoln switched character. Like the guy who reaches for his carpet slippers after he's won the girl, or the gladiator who sheaths his broadsword after successfully pigsticking the dragon, Lincoln took off its competition coveralls, slipped into white-tie-and-tails and emerged as a conservative, distinguished gentleman with discreetly-concealed muscles. The only holdover from the hell-for-leather "Mexican" Lincolns was the car's outstanding roadability and handling prowess.

If a big car has ever been built that can out-handle the Lincoln, then I've never had the pleasure of driving it. This, plus terrific brakes, makes Lincoln as safe a car as has been built to date.

Performance-wise—meaning top speed and acceleration—Lincoln no



Style-wise, '57 Lincoln is two inches longer, left. "The rear fender line, which starts just aft of amidships, produces lower illusion, as do flattened-out front fenders," says Tom.

Redesigned grille boasts four headlights dubbed Quadra-Lites. The lower pair are optional. Massive parking lights and directional signals are coupled above restyled bumper.

"Rear fins have been flared out and taillights now remind you of a fire in a Gothic chapel," says Tom. The identifying star emblem is now on hubs, tail, front fenders and hood.

Lincoln

brakes make this new job "as safe a according to Tom.

longer is making a serious attempt to be the Whiz Kid of the drag strips or the speed trials. Like a retired Derby winner, Lincoln now rests on its laurels. Size went up, engine capacity was increased and the old champ acquired a smooth but horsepower-robbing new transmission. In 1956 Lincoln was a close contender for the finest-looking automobile ever produced in the land of Soapy Williams and Walter Reuther. The cars were still fast but had acquired an Ivy League look that made at least one of their competitors resemble the Limehouse Button King. With the aid of Ed Sullivan's stumping, Lincoln enjoyed the best sales year in its history.

There are many types of buyers of cars in the Lincoln class and they in-

General Tire Company's new Dual 90 tires were tested by Tom along with Lincoln on wetted-down hill at speed. Tires stopped car dead on this 30-per-cent-plus grade.

clude the successful man who has made his pile and suddenly realizes he has forgotten to have fun along the way. Lincoln made its main pitch in '56 to this well-regulated character of taste who wanted superb and enjoyable transportation in a conservative package, a car that didn't have to go in for hand-tooled saddlery and a garland of silver dollar decorations that shouted "money" in a loud voice.

From a performance standpoint, give or take a wheel turn or two, there has been no increase in over-the-ground rapidity from the '56 jobs. Zero to 60 still takes 12 seconds. When correctly tuned, these big Lincolns will just edge the 110-mph mark. They do, though, have a way of slamming into a corner or whipping through a bend with all the steadiness of a bowling ball transversing a laundry chute at speeds that would dump some of the competition head over teakettles.

When I tested the '57 Lincoln it was under rather odd circumstances. I had been hired by the General Tire Company to rip their new Dual 90 tires apart (if I could—and I could not). The car selected for this test, by me, was the big Lincoln Premiere. Though my main job during my first runs with the '57 Lincoln was to test these tires, I also had quite an interest in saving my fat neck, which was one of my reasons for choosing the car I did. I'm happy to say I didn't goof. One series of brake and tire tests called for standing on the brakes as hard as I could and bringing the car to a full stop from speeds up to 105 mph. This was on rough concrete. These tests were so severe that the tires burst into flames but the Lincoln brakes grooved a straight line down the roadway like a

You can see smoke rising from Dual 90 tires which burst into flame during series of

bullet from a tournament rifle and literally stopped the car in its tracks.

It doesn't take a wagonload of imagination to figure the stress such a test creates, not only on brakes but on the frame, wheels and every component part. I made nine of these stops and then went to the high-speed turning area. Here, in a 360-degree turn less than 120 yards in diameter, I kept this Lincoln going at rollover speeds for more than 40 miles, trying to rip the tires off. (Though I was being paid to test *tires*, this '57 Lincoln was getting a helluva test, too.) Frankly, in a lot of cars I know, I wouldn't have had the guts to try the tire test I made with the Lincoln. Afterward I made wetted-hill stopping tests on grades of more than 30 per cent with the car running at a good head of steam. On the road-race circuit (or road-handling course, as they sometimes call it), I gave the Lincoln everything it had. As to handling and safety, there's very little more I can say but that for these professional tests of tires I selected Lincoln to pull me through.

Style-wise, the '57 Lincoln has been sharpened up considerably over '56. The car is two inches longer and now boasts four headlights which give it the appearance from head-on of Paul Bunyan and his brother challenging you with over-and-under shotguns. The rear fins have been flared out and the taillights now remind you of a fire in a Gothic chapel. [*Continued on page* 161]

Four-door Landau hardtop has large chrome plates in place of the rear vent windows.

SPECIFICATIONS

MODEL TESTED:

1957 Lincoln Premiere four-door hardtop

ENGINE:

V8 cylinder, OHV; bore 4.00 inches; stroke 3.66 inches; maximum torque 415 foot pounds @ 3000 rpm; brake horsepower 300 @ 4800 rpm; compression ratio 10 to 1

DIMENSIONS:

Wheelbase 126 inches; overall length 224.6 inches; tread 58.5 inches front, 60.0 rear; width 80.3 inches; height 60.2 inches; weight 4,800 pounds; standard tire size 8.00x15; gas tank 20 gals

PERFORMANCE:

0 to 30 mph, 4.4 seconds
0 to 50 mph, 9.5 seconds
0 to 60 mph, 12.0 seconds
0 to 70 mph, 15.8 seconds
Top speed, 110 mph

SPEEDOMETER ERROR:

At 60 mph on speedometer, actual speed 57.3 mph

tire tests in which Tom hit the brakes at 105 mph. He couldn't rip these tires apart.

McCAHILL TESTS

THE '57 PONTIAC

"The hottest full-sized sedan I have ever tested," reports Uncle Tom.

By Tom McCahill

AS A sleeper, the 1957 Pontiac would make old Rip Van Winkle look like a benzedrine addict.

I discovered this after receiving a letter from Pontiac's Director of Public Relations Bob Emerick, calmly asking when I'd like to test their new offering and making none of the usual Michigan pitchman claims: "It's the longest . . . lowest . . . widest . . . most powerful . . . totally new concept . . . etc."

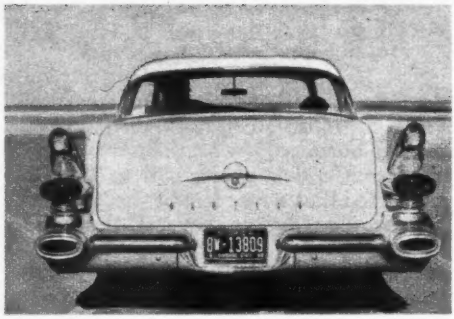
The McCahill Circus—complete with boat, dogs, Jim McMichael and etceteras (I've got more etceteras than any guy in the business)—was about to head south. A quick phone call to Detroit suggested that a real test of the '57 Pontiac would involve several thousand miles of driving—and that the best place to start would be Florida. Bob rose gamely to the bait and when I tossed my hawser ashore at the Daytona Beach Boat Works, there he was—with a brand-new sunburn and gleaming 1957 Pontiac—waiting for me on the dock.

The next three days were spent cleaning up the boat and puttering around—and then one night I discovered just what a sleeper this car is.

I was stopped for a traffic light on US No. 1 when a messy-faced young kid sidled up to the Pontiac driving one of those weird vehicles known to the Pilgrim fathers as a "rod." Mind you, until now I'd paid the Pontiac less attention than P. Samuel Whiteman might give to a ferryboat fiddle player. The light snapped green and the kid in the rod shoved his foot through to the front axle. Having anticipated this possibility, I had slipped the Pontiac Hydramatic into the Third or acceleration range. With McMichael, my wife and a dog in the car, the Pontiac momentarily stood still while the wheels spun and then—*zoonk!* I whipped past and away from the kid so fast that if his radiator cap hadn't been screwed on tight, my vacuum would have sucked the water out of his cooling system. "What's this?" I exclaimed.

I had driven the Pontiac around Daytona for many miles and never had a suspicion that this car, with an engine that idled as smooth as hair tonic over a bald head and was as well behaved in traffic as a New York City police horse, contained under its hood one of the most hairy-chested, fire-eating, explosive screamers I'd ever driven. Here

McCahill really gets around when he tests a car. Here he gives the Pontiac once-over from all angles.



Famous chrome striping Tom calls "jukebox decoration," has been completely removed.

was a bomb with finesse. A fast trip to the measured mile on the beach to get the speedometer calibrated correctly and then back to a hard surface road quickly revealed the facts: 0-60 mph in 8.3 seconds and over 100 mph before you can yell "Cop!" makes the word "sensational" seem very trite. "Phenomenal" would be more like it. This car had more than twice the boff of any Pontiac built just a few short years ago.

I got back to the boat and dug out the specifications Pontiac had forwarded. The car was the Super Chief with the big engine, displacing 347 cubic inches. If you bear in mind that the Chrysler-powered Cunningham racers of just two or three years ago had big Chrysler V8 engines that only displaced 332 inches (the same as Cadillac in those days) you'd see that the new Pontiac has an engine just a squirrel and a half smaller than the average college gymnasium. Also, before you read this, fuel injection will be available (which seems pretty unnecessary to the writer unless your job calls for chasing guided missiles).

The year is young in new car testing and I have many cars ahead of me, such as the Chrysler 300C and others, but at this writing let me go on record as stating that after making nearly 100 acceleration tests, the 1957 Pontiac is the hottest full-sized sedan *I have ever tested.* It may be topped next month. But as this goes to press the Pontiac smashed every acceleration record ever reported in MI for a full-sized production sedan.

I can hear that change jiggler in Southeast Bearnose, Mont. shouting, "But what's happened to the economy? Horsepower costs dough and consumes gas." Answer: this big 10:1 compression ratio engine averaged 18.6 miles to a gallon all the way from Florida to New York with the car fully loaded with three people, an 80-pound dog and several hundred pounds of luggage. You old-time Pontiac owners with the junior-sized six cylinder arrows under the hood would have quite a time topping that.

Before I get completely away from performance, let me state that young Bill Knudsen, Pontiac Division Chief, set out (so I understand) to give this car the ability to whip up to legal speeds in the least possible time. That he accomplished this is beyond question. But how about top speed? Of late, top speed

New Pontiac stands an inch over five feet, is 206.8 inches long, has 122-inch wheelbase.

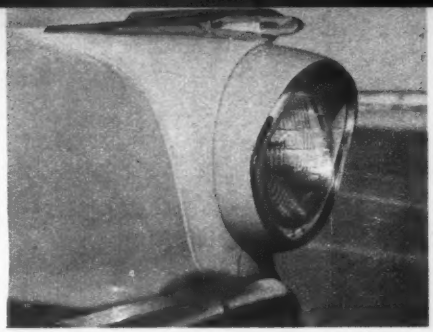
has come to mean less and less to buyers since practically all cars have proved their ability to do better than an honest 100 mph. However, this Pontiac Super Chief with the big engine will get right up to 130 mph with a reasonable tune-up job—and some in absolutely stock condition have already done as high as 144 mph on the Salt Flats. The Pontiacs will be the cars to keep a wide eye on during the Daytona Beach Trials.

By now, if you are the owner of a typical wife who's probably as bored with all this performance yak as a Russian interpreter's "No," here's what else the car has to offer. The chrome striping, which I was criticized for calling "jukebox decoration," has been removed completely. This is a 90 per cent improvement. If they had only gone one notch further and removed the two chromium sperm whale parking lights on top of the front fenders I'd give the car a clean bill of health, style-wise.

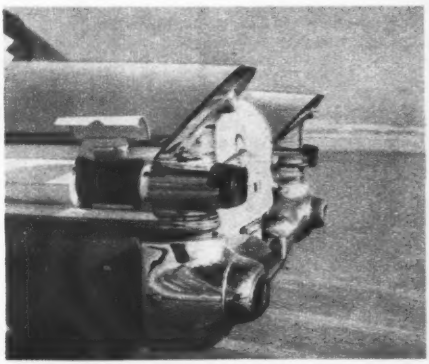
The roadability is good, but not the greatest, and the steering I found extremely hard and lumpy until I gave it two full lubrication treatments. Putting 30 pounds of air in all the tires also added to the car's stability and improved the steering. The front seats are comfortable, though not over-lush, and the rear seat is far from the most comfortable in the world for a 1,500-mile trek, though plenty adequate for average use.

One feature this car has is a *real* better-than-just-for-gloves compartment. Another [*Continued on page* 176]

"Roadability is good." Stability, steering are improved with 30 lbs. of air in all tires.



Tom liked styling except for "two chrome sperm whale" front fender parking lights.



Jutting taillights, dual exhausts and gas tank on left rear fender stylize rear end.

SPECIFICATIONS

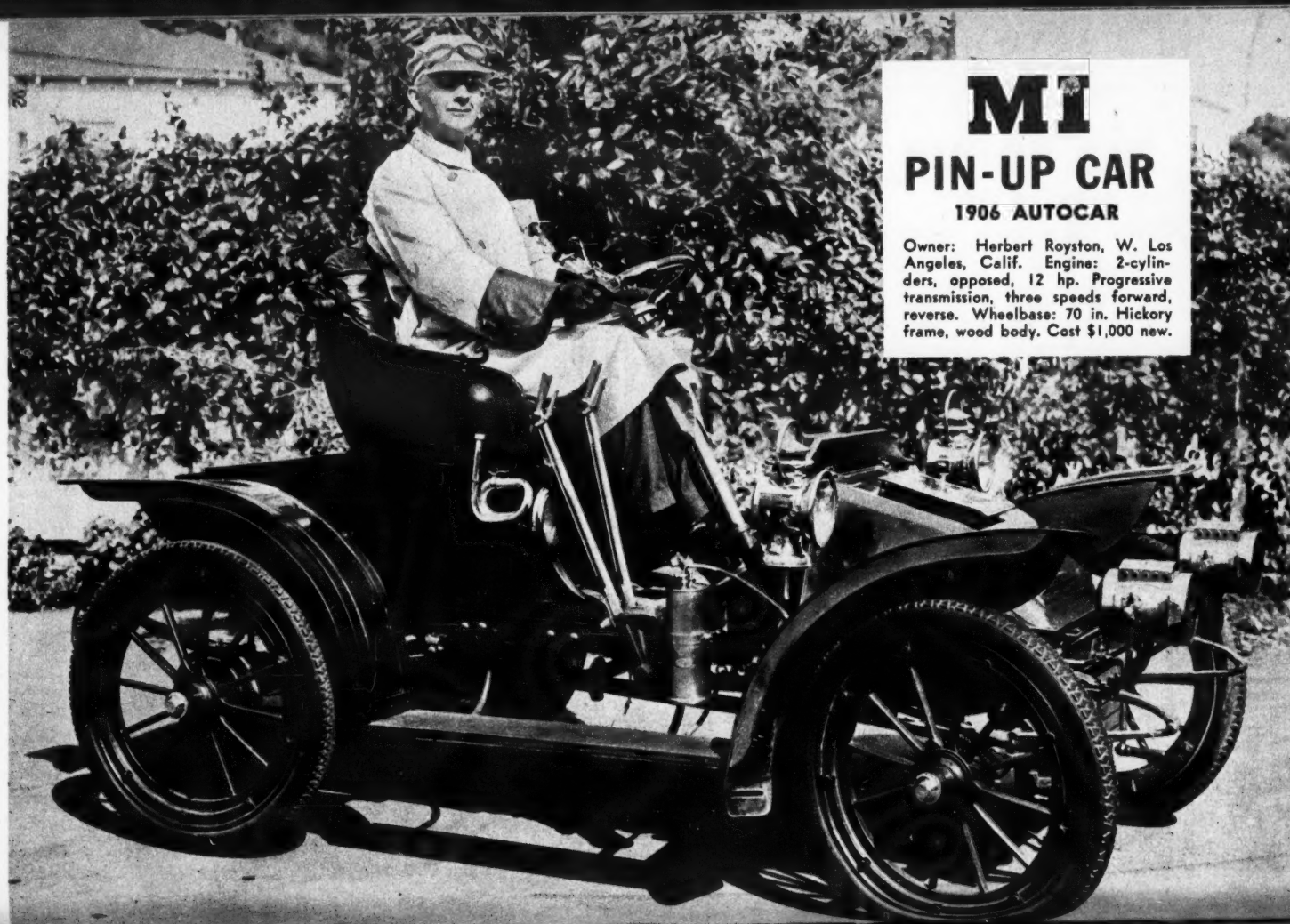
MODEL TESTED:
1957 Pontiac Super Chief four-door hardtop

ENGINE:
V8 cylinder, OHV; bore 3.94 inches, stroke 3.56 inches; maximum torque 359 foot pounds @ 2800 rpm; brake horsepower 270 @ 4800 rpm; compression ratio 10.0 to 1

DIMENSIONS:
Wheelbase 122 inches; overall length 206.8 inches; tread 59.0 inches front, 59.4 rear; width 75.2 inches; height 60.1 inches; weight 3,750 pounds; standard tire size 8.00x14; gas tank 20 gals

PERFORMANCE:
0 to 30 mph, 3.1 seconds
0 to 50 mph, 6.2 seconds
0 to 60 mph, 8.3 seconds
0 to 70 mph, 10.9 seconds
Top speed, 130 mph plus, depending on tune

SPEEDOMETER ERROR:
At 60 mph on speedometer, actual speed 54.8 mph



MI

PIN-UP CAR

1906 AUTOCAR

Owner: Herbert Royston, W. Los Angeles, Calif. Engine: 2-cylinders, opposed, 12 hp. Progressive transmission, three speeds forward, reverse. Wheelbase: 70 in. Hickory frame, wood body. Cost $1,000 new.

Eye Stoppers

NOON BOOM is automatic with this sun dial, burning-glass and cannon combo. Chinese originated this type of timepiece.

CUTE RECRUIT rig utilized by the USAF in Cleveland was built by a local garage. Tiny jeep is powered by motorcycle engine.

WIN $25

You can plunk $25 in the family bank account if you send in a sharp, glossy photo of an old-time car posed with the owner or a pretty girl. Car can even be new—if it is unusual. Include a self-addressed envelope (just in case) with all the vital statistics about car and owner to Pin-Up Editor, MECHANIX ILLUSTRATED, 67 West 44 St., N.Y. 36, N.Y. You may win that $25.

FAN BAN is enforced by Paris cop on this cabbie's clever but dangerous windmill cooler.

SHARPEST HARPIST Mildred Dilling plucks smallest of her famous collection of 55 harps.

STATES' PLATES collection owned by Phillip Hatch, Windsor, Vt., contains thousands.

King-Size Model Train Layout

The biggest little line in the world, it operates on a sprawling 35x98-foot layout.

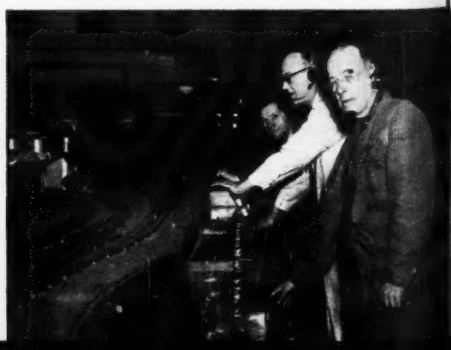
THE WORLD'S biggest little operating scale model railroad is the Union Connecting Railroad of the New York Society of Model Engineers, Inc. Begun in 1929, the society's modest 20x40 foot layout has mushroomed into a sprawling 35x98-foot spread.

Consisting of an O gauge and separate HO gauge layouts, the UCRR runs through a wonderland of scenic and mechanical splendor that includes a model of the Delaware Water Gap and reproductions of the Hoboken Terminal and its ferry slips.

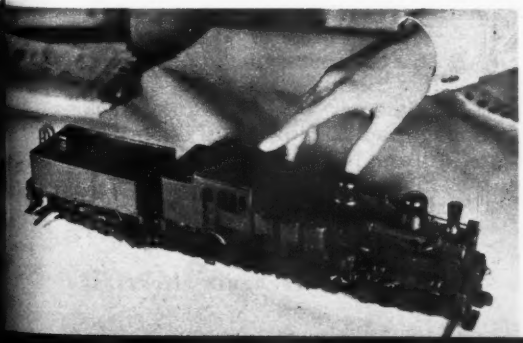
On specified nights during the year the line imitates an actual railroad in operation and time tables are set up. Unfortunately, the UCRR recently had to move from its old home in the Lackawanna Terminal, Hoboken, N. J. But the society hopes to continue operations in new quarters soon. •

Engineers at main control panel use telephones to coordinate operation of trains.

Delaware Water Gap stands seven feet high and is constructed of asbestos and cement.



Beautiful O gauge Shay-geared model locomotive built by Herb Walters of New York.



Here two model railroaders almost hidden by scenery make repairs inside a tunnel.

Spewing smoky ink in cloudless sky, small planes team up to make heavenly advertisement.

THEY WRITE ON AIR

Sky scribblers ply their trade at 10,000 feet in letters a mile long and a half-mile wide.

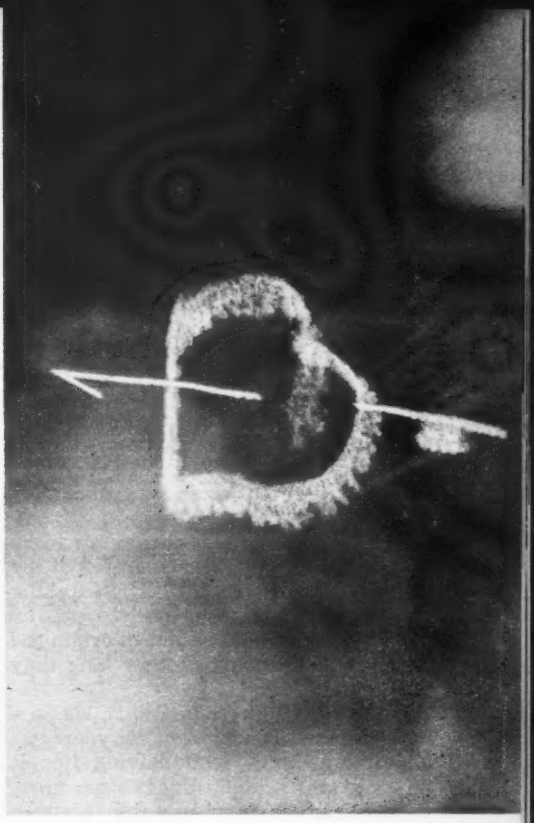
By Irv. Leiberman

ONE BRIGHT and cloudless day in 1920 the people of England were amazed to see a huge block of letters reading The Daily Mail etched in the clear blue sky. The skywriter was Major John Savage who used a 180-hp pursuit plane to write the first heavenly advertisement in smoke for the benefit of the London daily.

An interested viewer of this novel phenomenon was Allen J. Cameron who visualized the possibilities of skywritten messages. Two years later, without warning, a white streak a mile long appeared in an otherwise cloudless sky above New York City. Parallel to it and identical in size and form, another giant column began to take shape.

Soon a crossbar centered between the smoking lines joined them together. Fascinated spectators realized that a huge H had been drawn in the heavens by a plane that looked like a speck of dust in the sky.

Captain Cyril Turner, British war ace now working for Cameron, was giving



Skytyping, above, is latest technique. The script-lettered squib, below, is most difficult medium for sky scribes. Heart with arrow, right, was part of wedding decor for couple married on air liner over Iowa.

Manhattan its first glimpse of skywriting. As the large letters sprawled out across the blue, millions read the message, "Hello, U. S. A.—Call Vanderbilt 7-2000." It was the number of the Hotel Vanderbilt, temporary headquarters of the Skywriting Corp. of America. Curious callers kept the switchboard tied up for hours.

In the next few years advertisers took to the skies in increasing numbers. All over the United States, Canada and Cuba, groundlings responded to messages by advertisers who plugged their products in the air.

The first contract, which was nationwide, was bought by the American Tobacco Company to publicize Lucky Strike cigarettes. This ad cost $1,000. Then MGM plugged its hit films, Test Pilot and Fury; the New England Confectionary Company lauded its Sky-Bar and General Motors its Chevrolet. Politicians had their names inscribed for all to see.

The skywriting business, as Sidney S. Pike, president of the Skywriting Corp. of America and his pilots point out, is not a case of supply and demand. They can't possibly fill all the orders and they don't bother trying.

"Customers who want messages and ads never consider the weather or time," Pike complains. "Movie companies, for instance, always want signs at a specific time. We're not like the mailman—snow, sleet, clouds and rain stop us cold."

The most natural form of skywriting and the most familiar is the single column of smoke emitted under pressure from one plane. It is produced with a secret light paraffin oil formula known to but a handful of people. Heat from the engine expands the chemical into white smoke at the rate of 1,000,000 cubic feet a minute. A plane can carry up to 30 gallons of the mixture which is equivalent to about 30 smoke letters.

These letters must be written back-

wards in the sky so they will appear normal on the ground. To understand a sky scribbler's skill, try to write your own name upside down and backwards on a piece of paper so that it will appear right-side-up when held up to the light. Produced on a horizontal plane at about 10,000 feet, the letters are about one mile long and a half-mile wide.

Once in an ad purchased by a candy company, the pilot spelled the client's spiel forward instead of backwards. Puzzled onlookers read Ydnac Tfol.

There is no eraser for the blackboard of the sky. A pilot must be constantly on guard against making mistakes. He has no time to backtrack and check for accuracy.

Skywriting is effective for ten to 20 miles depending on the clearness of the day. When the weather is right and the breeze favorable, it is hard to predict just how far from the point of origin the letters will be swept or how long they will remain intact.

One skywriter, Andy Stinis, wrote a message over Toronto several years ago and an hour later, while having dinner, he could still read it. Yet at other times the letters fade away in a few minutes.

Script letters, which look like handwriting, are more difficult to make. Script is a rarity in skywriting as pilots prefer unlinked letters. After drawing a single letter, the pilot must climb 50 feet before making the next one. This prevents propeller backwash from smudging letters.

Always on the lookout for new advancements, skywriting firms are now experimenting with colored smoke. Soon messages may appear in contrasting shades of red, yellow and brown.

Perhaps the biggest advancement in skywriting is Skytyping, invented by Pike. In the old-fashioned method, one plane takes about 15 minutes to spell out ten letters. In that time the first letter may be scattered, spoiling the effect. In Skytyping, however, seven AT-6 trainers can do the same number of letters in two minutes.

This amazing feat is done by having the planes fly wingtip to wingtip in a straight parallel course. In the center the "mother plane" sends out a radio tone impulse each second. Every plane is equipped with a control board which has 200 plug-in sockets. Each board has been preset according to a message pattern.

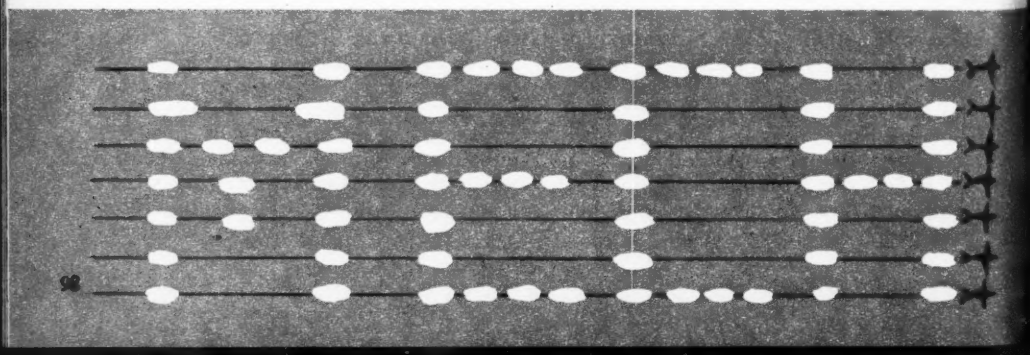
As a radio signal is received a switch is automatically thrown on the control board and a 375,000-cubic-foot puff of smoke comes out of the exhaust tube. The result is clearly defined block letters composed of puffs.

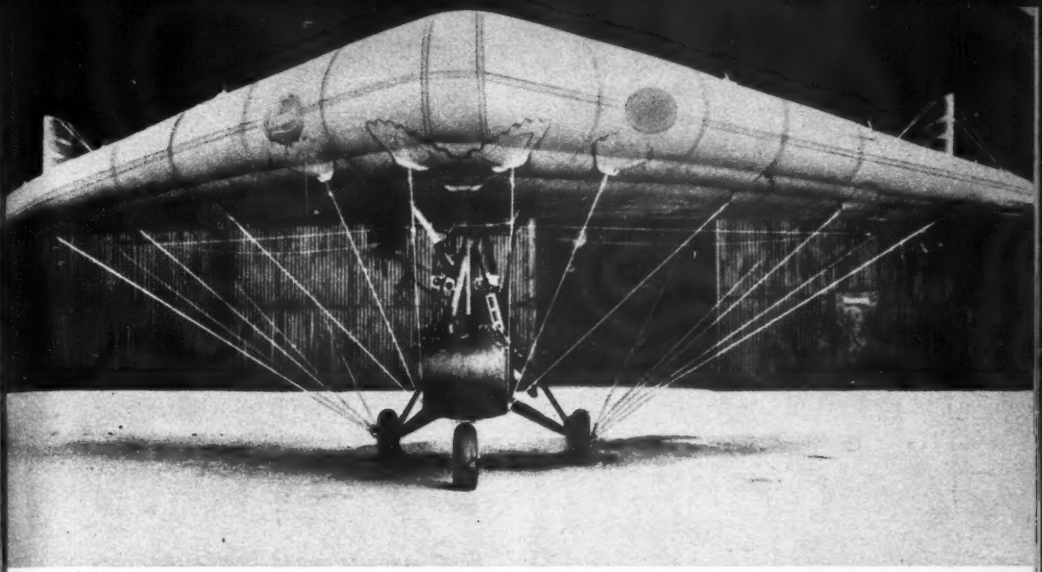
Using Skytyping, seven pilots can print a 21-letter, 15-mile-long message across the sky in five minutes. Each letter is made in ten seconds flat.

Compared with single plane skywriting, which costs about $300 an ad for 30 sky-high letters, Skytyping is more expensive. Figured on a national coverage quantity basis, the cost is about the same.

So that you won't think sky scribbling is always dull work, skywriting pilots have become expert artists as well as penmen. Most of them can draw almost anything with their exhaust pipes but a glass of beer. But don't bet they can't do it. They have been known to play tic-tac-toe with each other in the sky on dull days. •

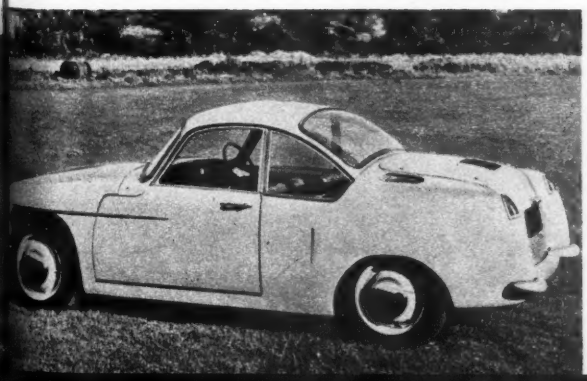
Diagram illustrates how Skytyping is done. Seven planes team up to form the message.





INFLATABLE WING on novel British aircraft is deflated, rolled into bag and packed in fuselage after flight. Ship is designed for small landing fields.

IT'S NEW!



ROVER gas turbine auto has its 110-horsepower engine with heat exchanger mounted in rear. Experimental 100-mph-plus English vehicle has a plastic body and four-wheel drive, no raditor or gearbox.

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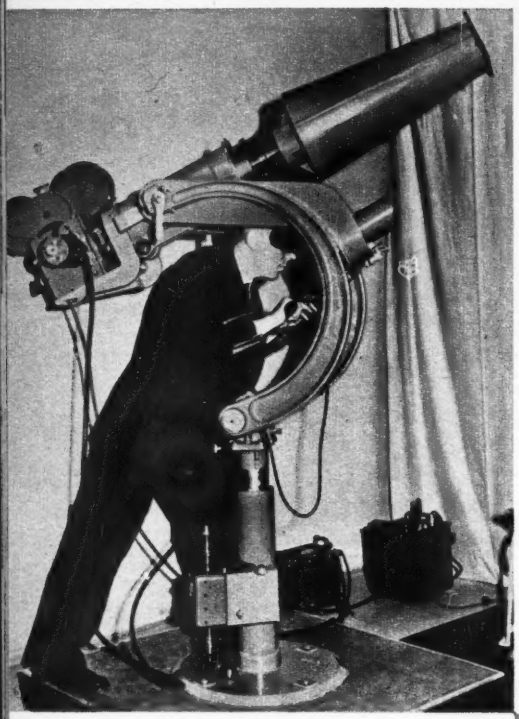
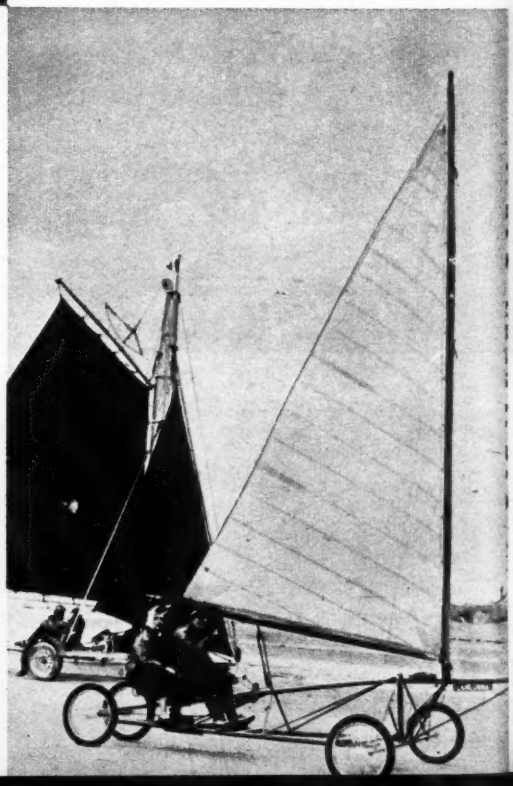


JET AGE high-speed camera is designed to track, photograph guided missiles in flight. It was recently shown in London.

SPOT of tea or cup of java can be made in this nobby combination pot exhibited at fair in Leipzig, Germany. Percolator is shower-like attachment on end of spout.

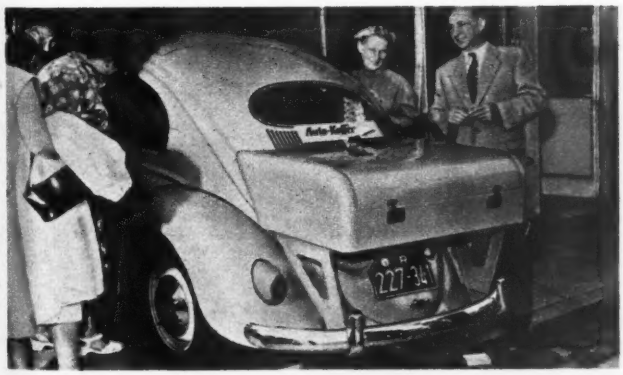
SAND YACHTS jounce merrily along hard-packed sand at Lytham St. Annes, England. Enthusiasts raced their wheeled homemade craft powered by the whims of the wind.

PULL-OUT engine on this easy-to-repair English farm truck amuses gaping crowd. Power plant sits under driver's seat.



ALL-PURPOSE aluminum chair, below, extends to 34-inch high chair for Junior come chow time. It was designed by Eddie Peyton of W. Miami, Fla., father of six.

LOW CHAIR arrangement, above, converts it to eight-inch-high stroller for sightseeing along the boulevard. Thirteen-pound device is also excellent for TV viewing.



LUGGAGE RACK for Volkswagen was recently exhibited at a Fall Fair in Frankfurt, Germany. Easily attached to car in a few minutes, trunk costs about $65, is 110 lbs.

FLIPPED sideways, rack allows VW owner easy access to engine. Device is made by Kurt Maruitz firm in Duesseldorf to fill long-felt need on little autos.

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So You Think THIS Is Cold?

Teeth chattering? Fingers numb? Well it's warm compared to what the lab boys call Absolute Zero.

By Lawrence Sanders

"'TIS BITTER cold and I am sick at heart," quoth Hamlet. And right now most citizens are hunching along, swaddled to the ears against the cold and muttering, "You said a mouthful, Bard."

Is it cold enough for you?

As a matter of fact, it probably *is* cold enough for you—whether you live in Weeping Water, Neb. or Hiram, Ga. One man's heat wave is another man's cold snap and a Key Wester can be just as uncomfortable at 40° F as a Bald Eagle, Minn. resident when the mercury goofs off to —40° F.

If you think it's cold where you are, be glad you don't dwell in the glorious villages of Omyakon and Verkhojansk in wildest Siberia. These garden spots hold the world's record for low temperatures. Omyakon went to —93.5° F one winter and the Omyakoniks thought they were pretty cold potatoes until Verkhojansk spoiled their fun by posting a new low of —108° F.

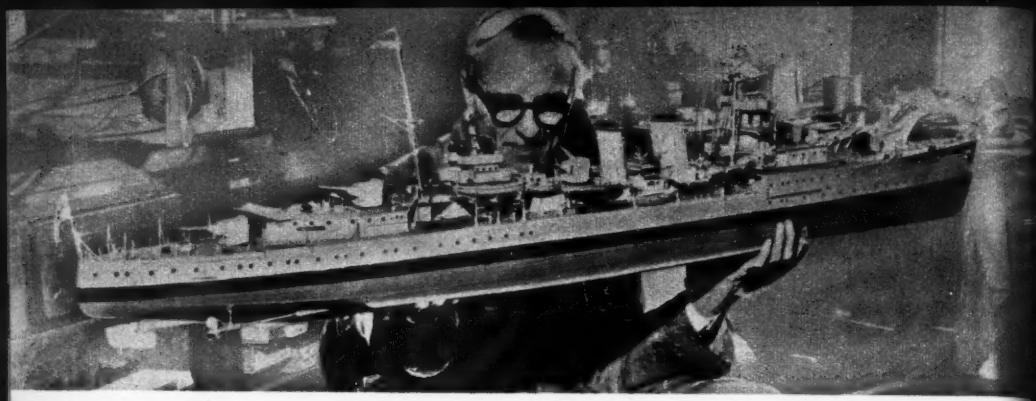
A recent visitor to Verkhojansk claims that come December, everything in Verkhojansk goes inside the huts—and he means *everything,* including people, pigs, oxen and reindeer. The men, being smarter than the animals, immediately begin hitting jugs of *sapoi,* a Siberian 'shine reportedly made of old moss, scrapings from reindeer antlers and shredded copies of Izvestia, all mulched down with potato alcohol.

The male citizens of Verhojansk stay in a delightedly befogged alcoholic hibernation for the two coldest months, waited upon by their devoted and sober spouses. When March rolls around everyone gets shakily to his feet and it's, "Come on, men—let's get out on those steppes!"

Siberia may be a mite chilly but parts of this country have nothing to be ashamed of. This deponent remembers a winter of his youth spent in northern Minnesota when the mercury hit —56° F. A lot of people say Minnesota gets a dry cold which isn't as bad as, say, the wet cold of the Norfolk waterfront in January. But dry-shmy, I tell you it was *cold,* and things weren't helped any when a playful comrade suggested I put my tongue against an iron post to see just how cold it was.

Alaska is probably the coldest spot under Old Glory. It once hit —81° F at a lonely little airport called Snag, in the Yukon.

But wherever you live, you'll agree it gets cold. How do you stand it? Body heat to withstand cold is manufactured by all warm-blooded creatures like press agents and whales by a process much like combustion. The body takes carbon and hydrogen from food and unites it with oxygen taken in via respiration. If it is cold outside, the air touches the skin and takes heat away. The body attempts to keep up our inner temperature, but when the mercury drops we need warm clothes to help. If enough clothes aren't available, the body sometimes fights a losing battle, particularly if the combustible material (food) or oxygen is lacking. If your body temperature drops about 30° below normal, you've had it—usually. There *was* that case of a Chicago woman who was found frozen stiff in a snowdrift, her body temperature 34° below normal and her veins loaded with dram shop anti-freeze. She lived to be an exception [*Continued on page* 161]

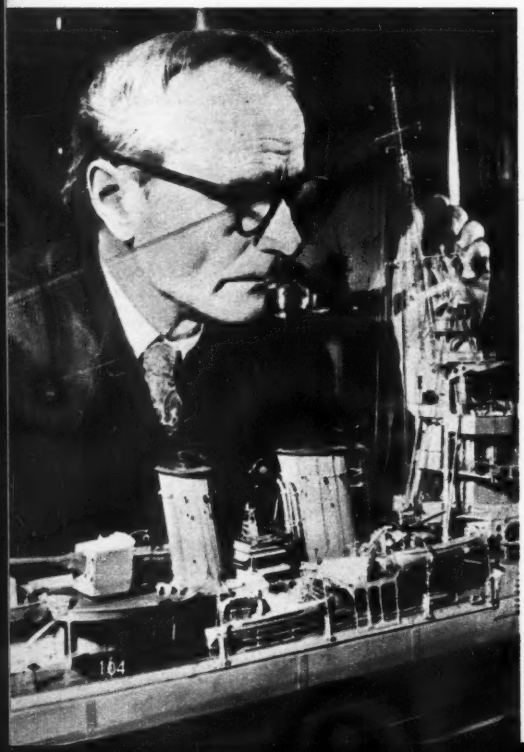


Norman Ough and 8-feet-to-the-inch model of HMS Curacoa, 1918 cruiser.

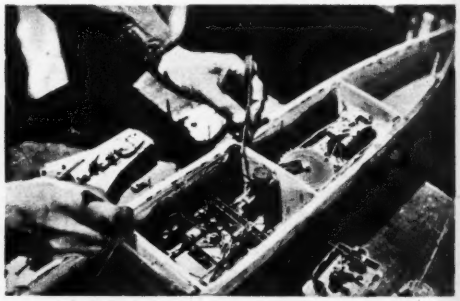
Mr. Ough's Little Ships

PROFESSIONAL naval modelmaker Norman Ough—you pronounce it "O"—has an ideal life from the point of view of many an ardent hobbyist. But his way of earning a living is an exacting one. Curators of government museums, movie producers and other types who can pay for his little ships, are demanding and critical. This Londoner has been a modelmaker since 1925. •

Ough places flag on Curacoa model, which has radio control for 30 different actions.

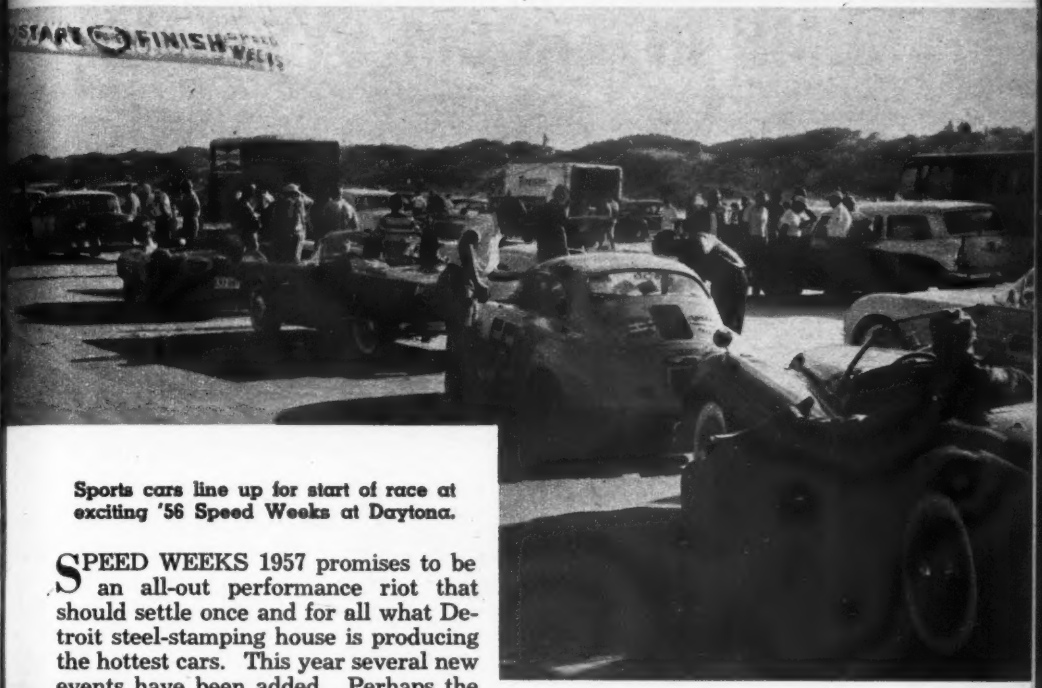


Curacoa's RC system. Steel model sells for $1700, required eight months to build.



Humble topsail trading schooner, the last type of sailing ship to give up to steam.

How to Race Your Car at Daytona



Sports cars line up for start of race at exciting '56 Speed Weeks at Daytona.

SPEED WEEKS 1957 promises to be an all-out performance riot that should settle once and for all what Detroit steel-stamping house is producing the hottest cars. This year several new events have been added. Perhaps the most important of these is the Big Three event. This will be a two-way, high-speed run over the Measured Mile, and a one-mile standing-start run open only to Fords, Chevrolets and Plymouths.

These camps will be limited to their most popular models and will *not* be allowed to enter cars with multiple carburetion, fuel injection or manual transmissions. The Fords, Chevrolets and Plymouths in this class must have automatic transmissions, one carburetor, and all normal equipment aboard. Another class that should prove interesting is the new Prestige Class, open only to the top dogs of the Big Three—which means Chrysler Imperial, Cadillac Eldorado and Lincoln Continental.

Speed Weeks start on February 3 and end two weeks later on Sunday the 17th. The main speed trial events for American cars will take place on Tuesday and Wednesday, February 12-13. The run for the Big Three class will be on February 11. The Flying Mile for sports cars will be held on Friday, February 8, with a sports car race on an airport course February 10.

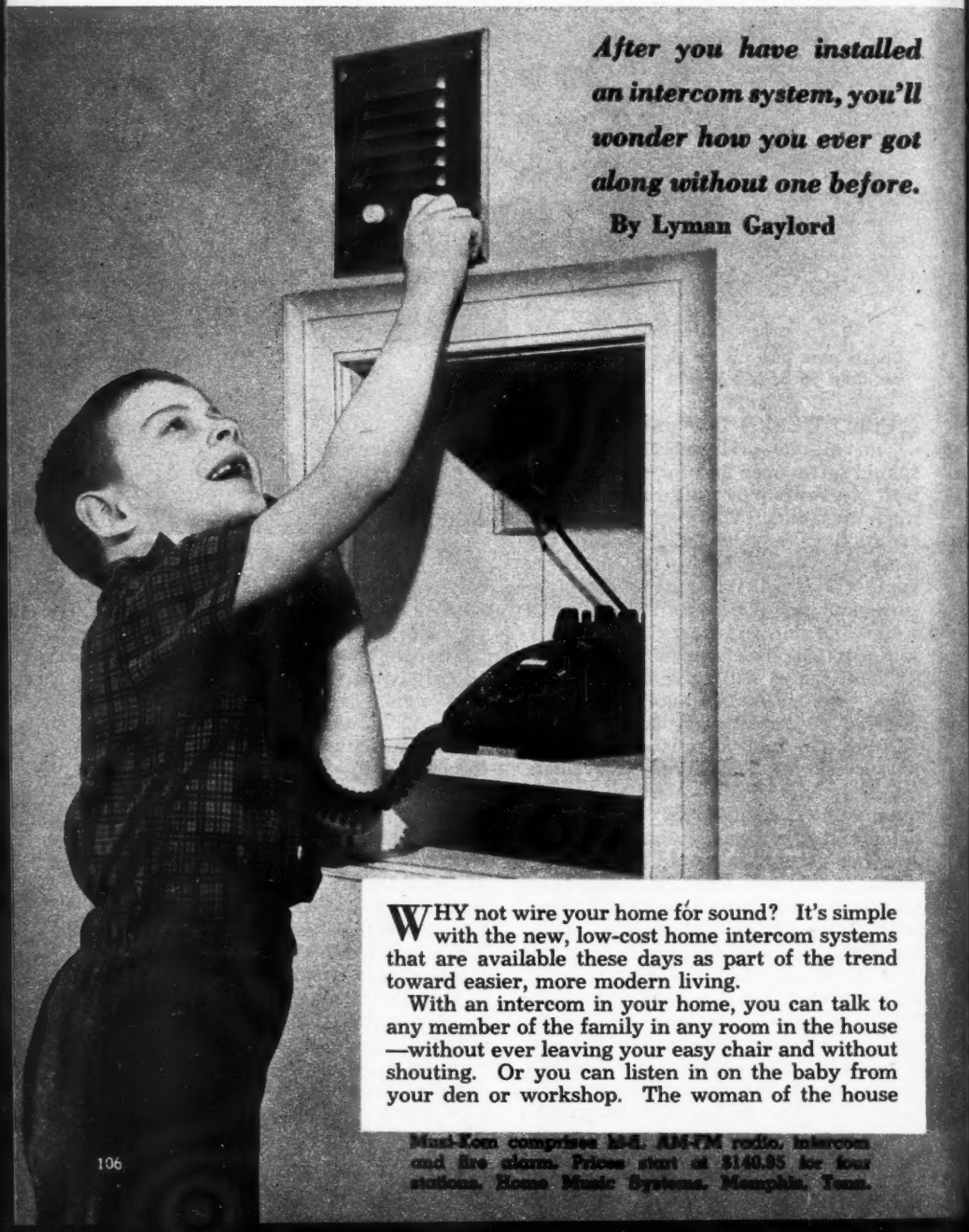
Though these events have been heavily covered in recent years by factory teams, it is still possible for an amateur to win, as proved last year when the Chevrolet, winner of its class in both the acceleration and Flying Mile runs, was driven by tourists who had no factory connections.

The MECHANIX ILLUSTRATED trophy runs will be held on February 13. The MI trophies are for the fastest production car in the Standing Mile and the fastest sports car in the Standing Mile. There will also be prizes in these acceleration tests divided as to displacement.

The main event is the Unlimited Class for standard production cars—two ways through the Flying Mile with an approximate two-and-a-half mile flying start. To avoid confusion, "standard production [*Continued on page* 166]

SPECIAL SERVICE SECTION

HOME INTERCOM SYSTEMS



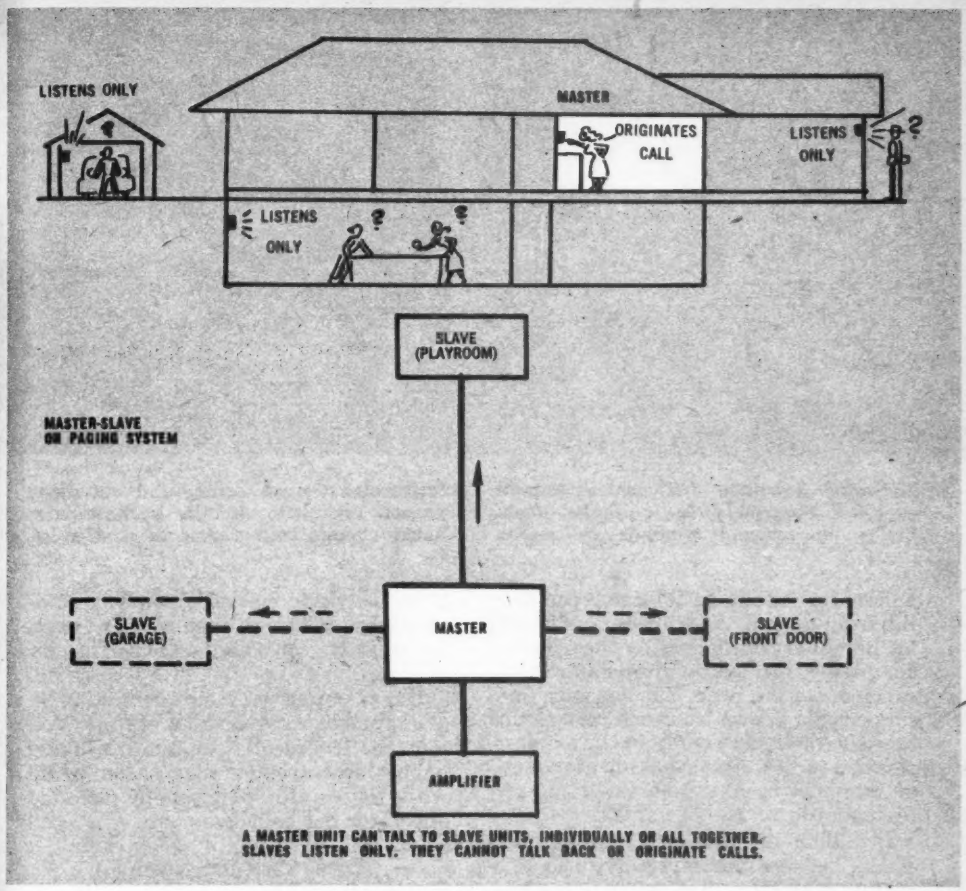
After you have installed an intercom system, you'll wonder how you ever got along without one before.

By Lyman Gaylord

WHY not wire your home for sound? It's simple with the new, low-cost home intercom systems that are available these days as part of the trend toward easier, more modern living.

With an intercom in your home, you can talk to any member of the family in any room in the house —without ever leaving your easy chair and without shouting. Or you can listen in on the baby from your den or workshop. The woman of the house

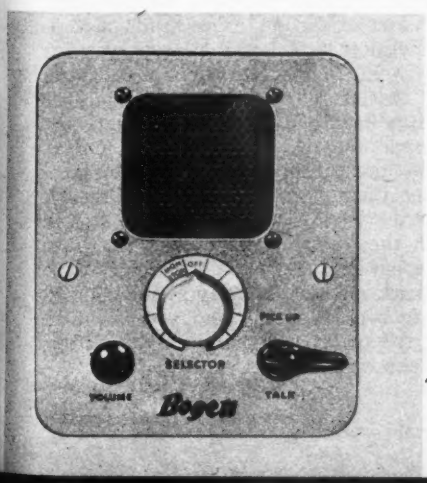
Musi-Com comprises hi-fi, AM-FM radio, intercom and fire alarm. Prices start at $140.95 for four stations. Home Music Systems, Memphis, Tenn.

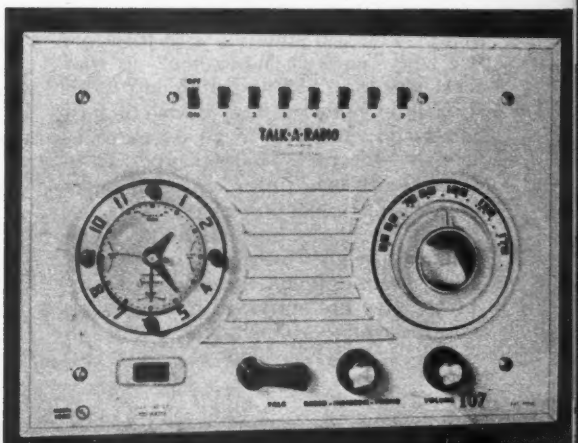


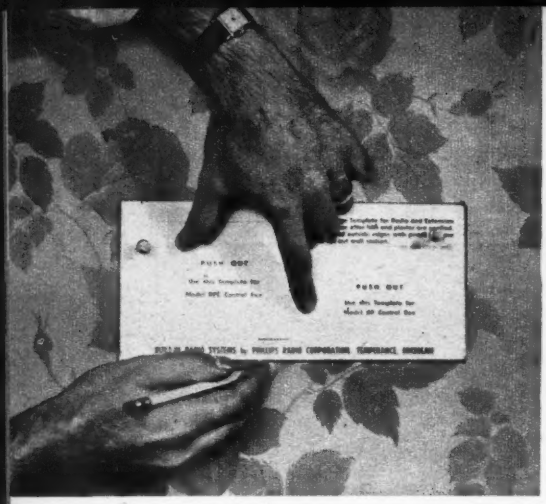
Typical master-slave or paging system.

This home phone system can be wired to nine stations. Master, $29.95; power pack, $57.75; remote, $14.50. Bogen, New York 14.

Talk-A-Radio (Dallas, Texas) has clock radio, intercom to four rooms, fits between wall studs. Available in 14 colors.







To install a built-in unit, center template supplied between 16-in. on-center studs. Scribe line around template as shown.

Drill hole at each corner and cut away plaster and lath with a keyhole saw. Insert chassis and fasten to stud sides.

will go for it too—an intercom can link the front door to the kitchen and it will let her query strangers at the door in complete safety and will save her thousands of steps a year. You can pipe music or radio shows from one part of the house to the other—without the expense of extra radios. And speaking of money, an intercom in your home, will add appreciably to its resale value.

Installing an intercom can be fun. That's because the only way to have a really satisfactory hookup is to get the whole family into the act—planning just what you need in the way of intercommunications.

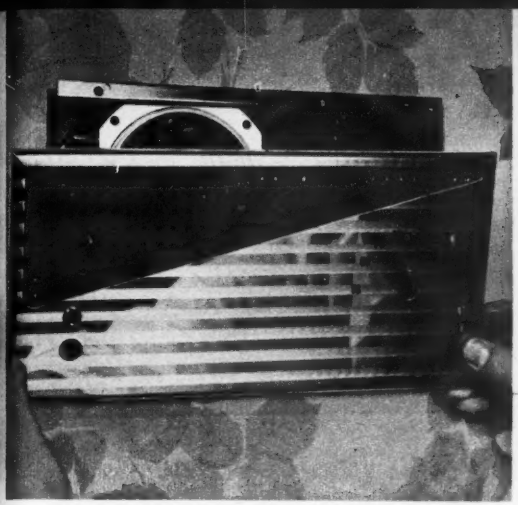
Planning is important because there's so much that can be done with the intercoms that are being offered to home owners by the twenty-odd firms making them. You can start off with a simple two unit "squawk box" hook-up that costs less than $25 and build up to an NBC-type network that allows a half dozen conversations to go on simultaneously—the cost, $150 and up.

There are even intercoms that operate without connecting wires. You just plug into a regular household outlet and broadcast right through the wiring. Other units almost think for themselves; they are activated by the user's voice. A number of units let you listen to the radio while listening for a call from baby's room. The radio is automatically silenced when baby calls. Some units even sound an alarm in case of fire.

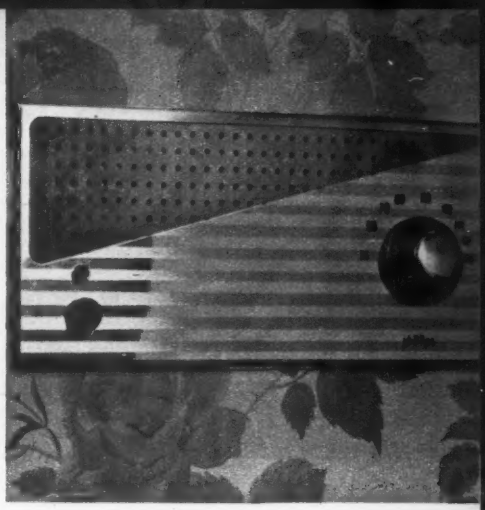
But planning your intercom is work, even though it can be a lot of fun. You must be aware of your family's living habits, eccentricities and needs. And while you're at it, play safe by planning ahead for the next five years.

The Various Systems

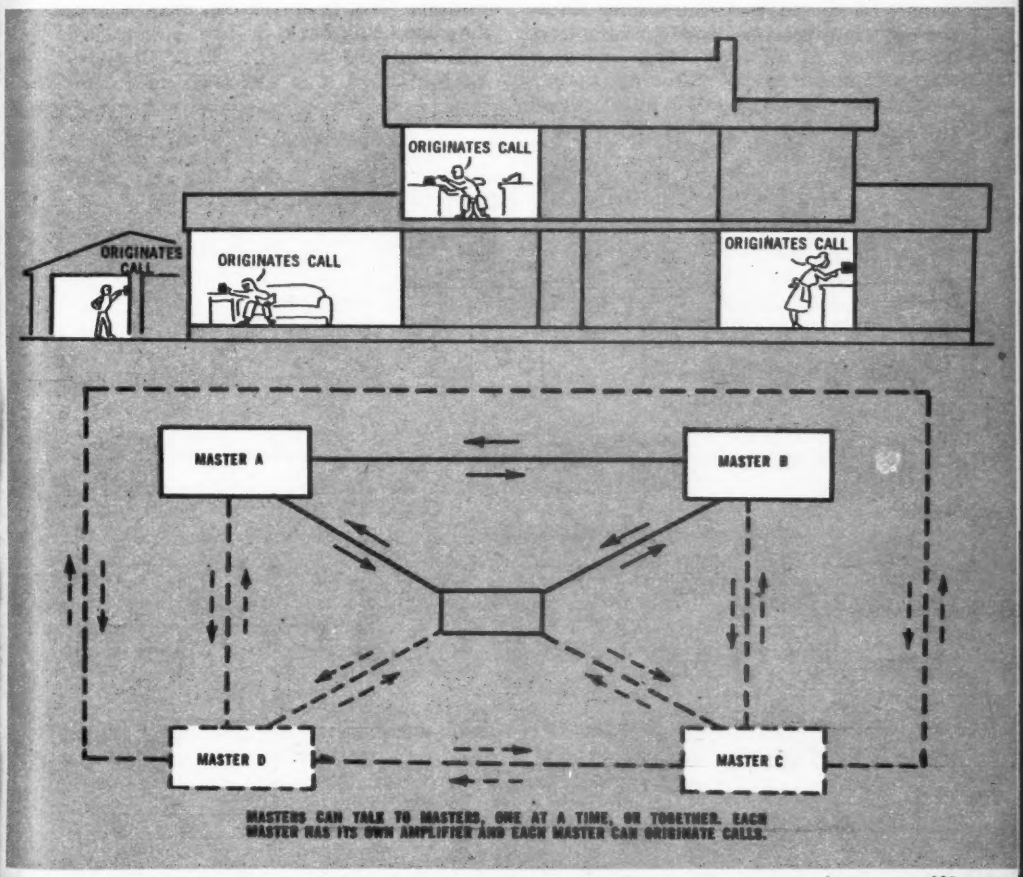
Basically, an intercom is a network consisting of a control station, called the *master,* one or more remote stations, called *sub-stations* and an amplifier along with the necessary switches and wires. Some systems do not employ a central amplifier but have one built into each master station. Two kinds of communication are possible, one-way or two-way. In the two-way set-up, both the master and the sub-station are equipped with a combination speaker-microphone. A switch on the master hooks the speaker-mike into the amplifier output or input depending on whether you want to talk or listen. With the switch in the *listen* position, the speaker-mike at the other end of the network is automatically switched into the *talk* position. When you want to talk, the switch is put in the *talk* position and the circuit is reversed.



Power cord connects to inside-the-wall receptacle, antenna dangles. Face plate clips to chassis, hides rough plaster cut.

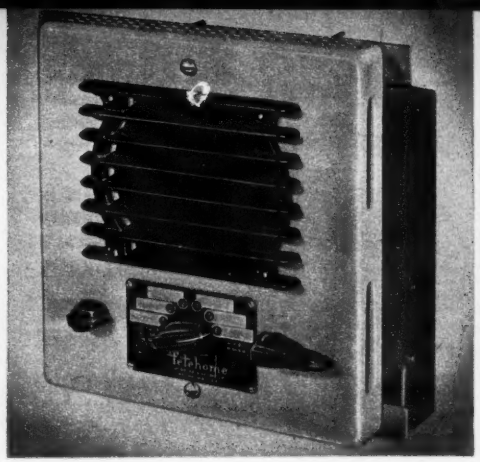


Installed built-in radio can pipe music to other rooms in house by means of separate speakers. Phillips, Temperance, Mich.



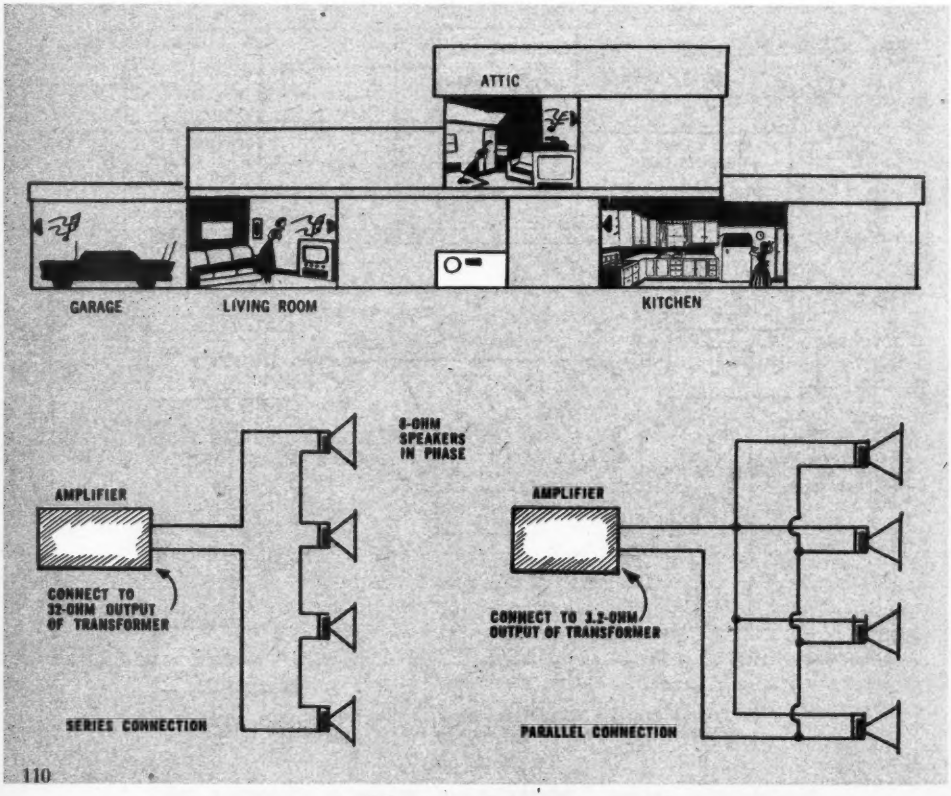
Master-master system. Each station can answer or originate a call.

Intercom in kitchen supervises nursery or other part of house. Sells for $24.95 with one station; Telectronic Co., Gardena, Cal.

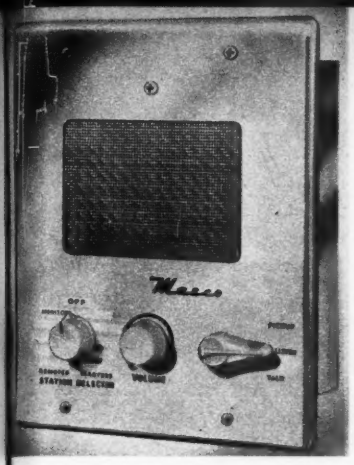


Webster Electric of Racine, Wis., makes this in-a-wall system. Extends only 3¾ in. into wall. Available for six or ten stations.

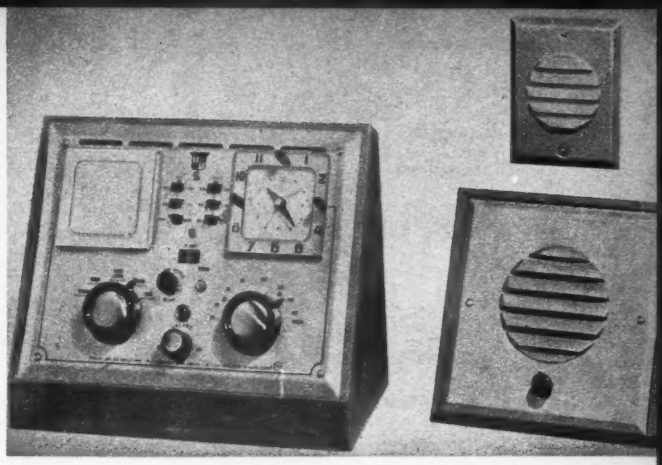
There are three basic intercom systems. The first type is the *master-slave* set-up. It gives one-way conversation between a master and one or more slave stations. These slaves can only listen; they can't talk back.



A home music system.



In addition to intercom work, master made by Mark Simpson of Long Island City 3, N. Y., can be used to unlatch the front door.



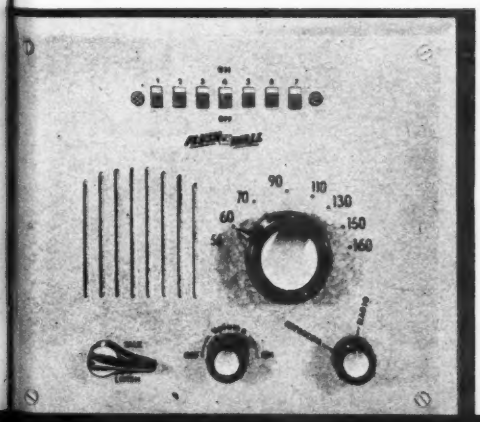
Elaborate radio-com made by Trans-Tel, Hollywood 38, Cal., has radio, timing clock. Can pick up conversation from 30-ft. distance.

The second kind is a *master-sub-station* circuit. Two-way conversation is possible but *only* the master can originate calls. This is the best set-up for an intercom to a front or rear door.

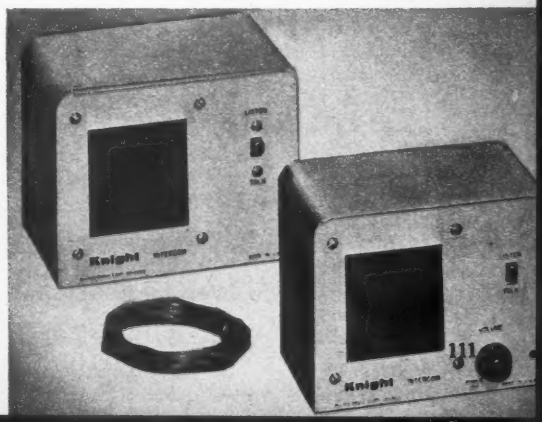
The third system is the *master-master* set-up. Here two-way communication is possible but *either* master can originate calls. An arrangement can be worked out so that each master is part of an individual master-sub-station (or slave) circuit. In this set-up, the sub-stations of circuit A cannot talk to or listen to the stations in circuit B although the two masters can carry on two-way conversations.

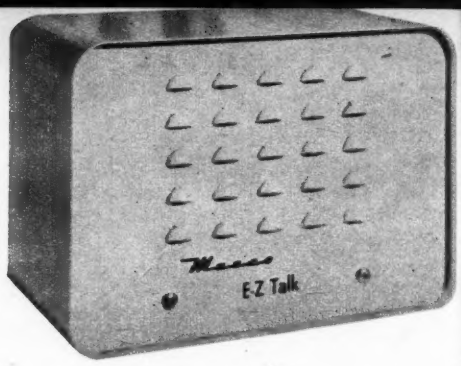
One refinement is a switch on the remote unit(s) that allows it to be cut out of the system altogether. Another refinement is a monitoring position on the master which leaves the master open to incoming calls (such as a cry from a baby) but closes it to outgoing calls (thus preventing a call from getting through to the nursery and waking the baby). Still another refinement is the addition of a radio at the master station so that music or other programs can be piped to selected locations. An electric timer connected to the master will turn on the radio (or the toaster or electric percolator), which piped to your bedroom, will stand in for an alarm clock.

Flush Wall Radio Co. of Clearwater, Fla., sells this intercom complete with four speakers and extension cords for $99.95.

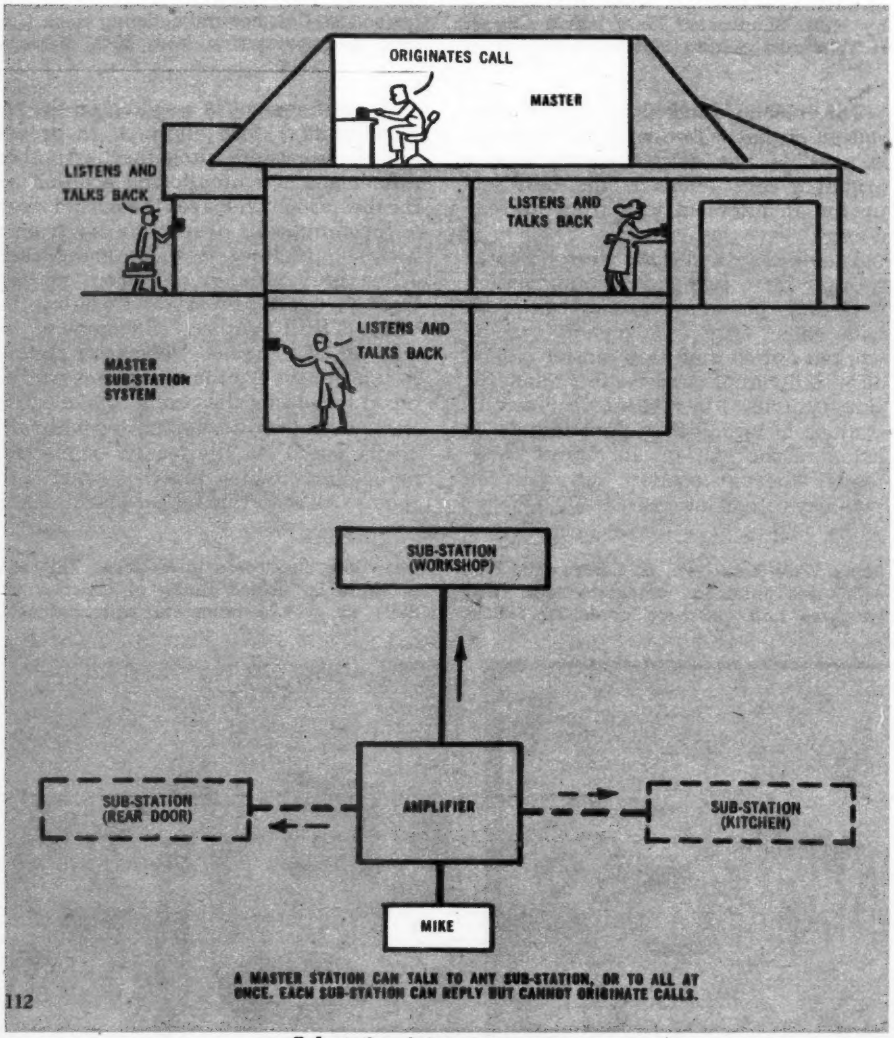


Intercoms also come in kit form. This one is made by Allied Radio of Chicago 80. Sells for $14.75 complete with cabinets.





Low-priced intercom set ($15 plus postage) sold by Wholesale Radio Parts Co., Baltimore 1, is complete with one master, one sub-station and 50 feet of connecting cord.



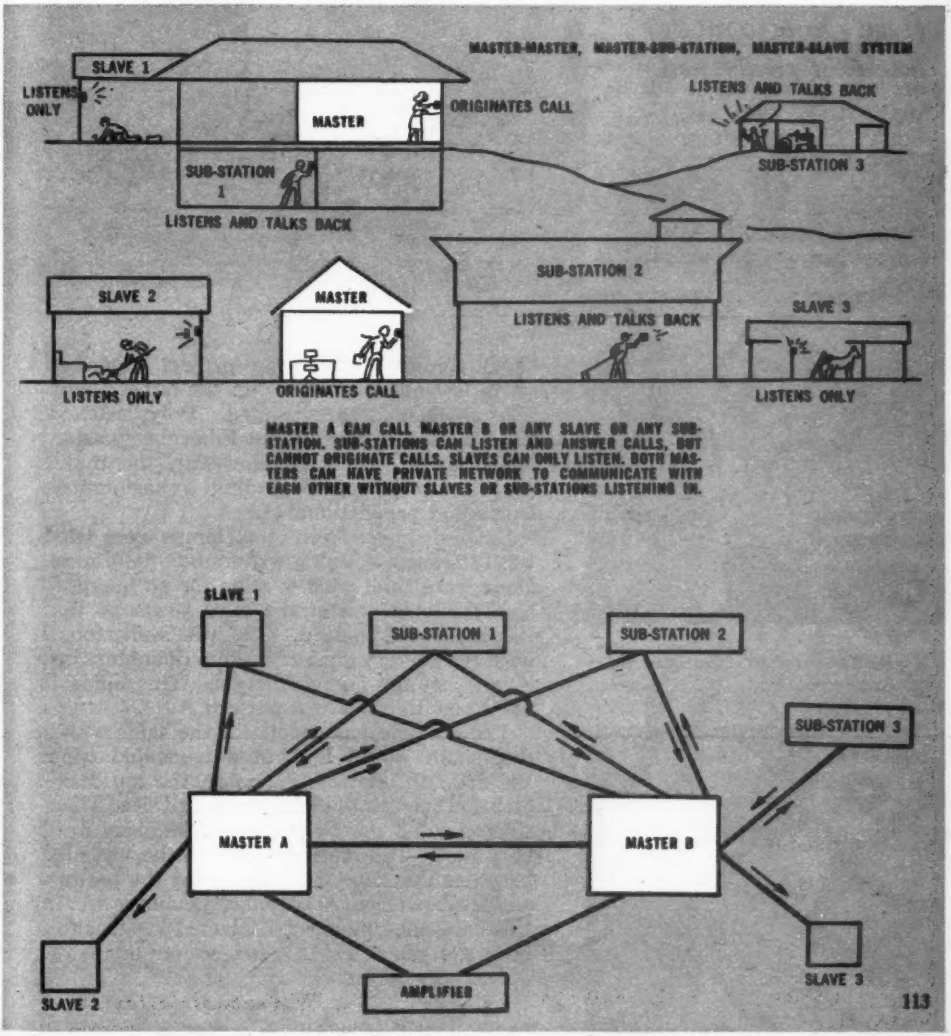
Sub-station intercom system.

How To Plan A System

Now that you have a general idea of what an intercom can do, it's time to start making your plans. To start with, make a list of all the rooms in the house; include utility rooms, workshop, garage, cellar, attic and back and front doors. Also list any outdoor areas that are used as play areas such as a patio or terrace. List all rooms and locations.

Now consider, the pros and cons of establishing communication from room to room, and room to various outdoor areas. You'll find that you may want two-way com- [*Continued on page* 139]

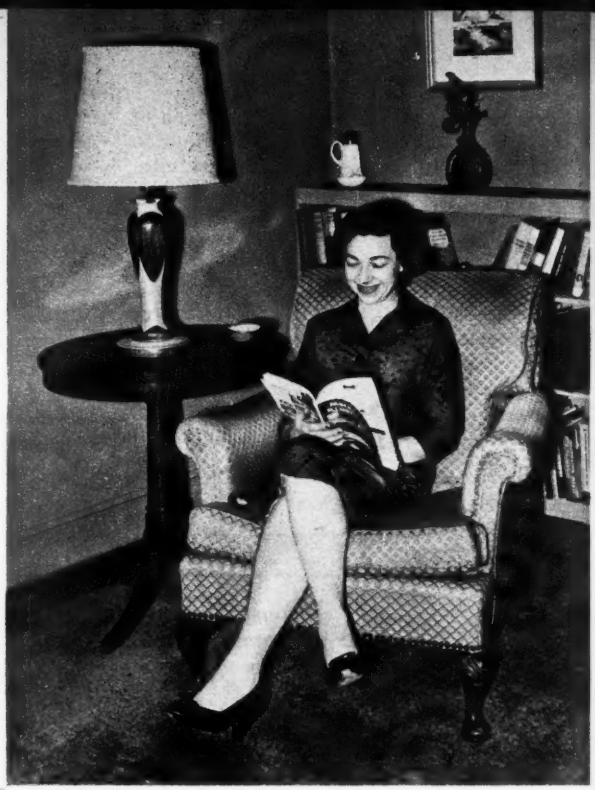
Another low-priced unit is the Zimphone sold by Vintage Products Co. of St. Louis 4. Operates on flashlight batteries; $10.



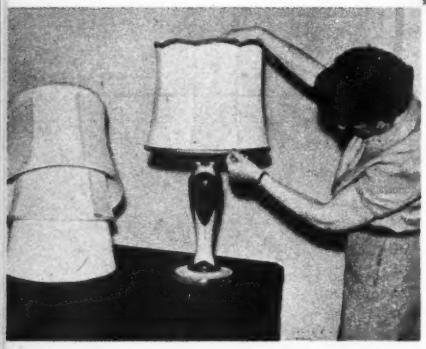
Elaborate system for farm with masters, sub-stations and slaves.

CUSTOM LAMP

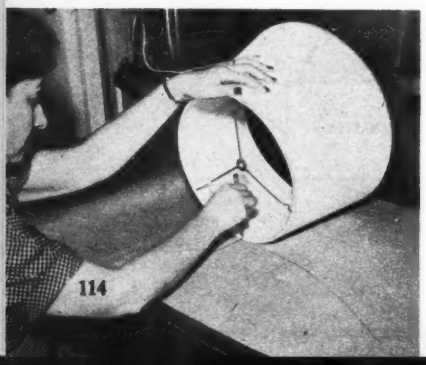
A fine lamp needs a suitable shade. Here's how to make one that really fits.



Try several old shades to determine best size and shape.



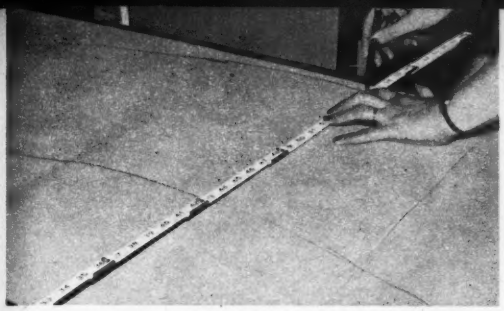
If you have a shade that you want to duplicate, trace it as shown.



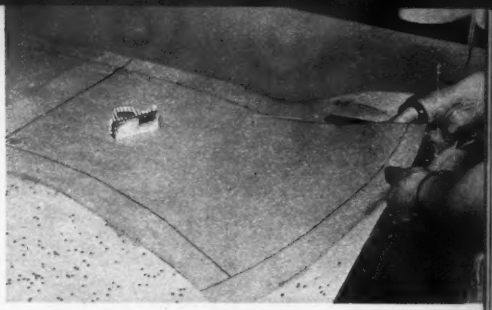
TO complete the lamp project described in last month's article on the lathe, a suitable shade had to be added. Polyplastex, a combination of plastic and Fiberglas, was selected as a covering. However, the major problem consisted of finding a harmonious shape and proportional size.

Several shades from other lamps were tried until the most suitable was found. Its dimensions were then used to shop for an inexpensive shade in one of the local stores so that its parts could be used. One was finally found with the correct top and bottom diameters but it was not the correct height. This made it necessary to cut a new pattern.

The pattern was developed the same way a draftsman would lay out a truncated cone. We drew the bottom diameter, the top diameter and the height of the shade full size. Then, we extended the two lines at the sides until they met. The meeting point to the top edge becomes the minor arc radius for the pattern and the bottom edge becomes the major arc. In this case, the dimensions selected were as follows: top diameter, 11½ in.; bottom diameter,



Trace pattern onto heavy brown paper. For new design use method shown in drawing.

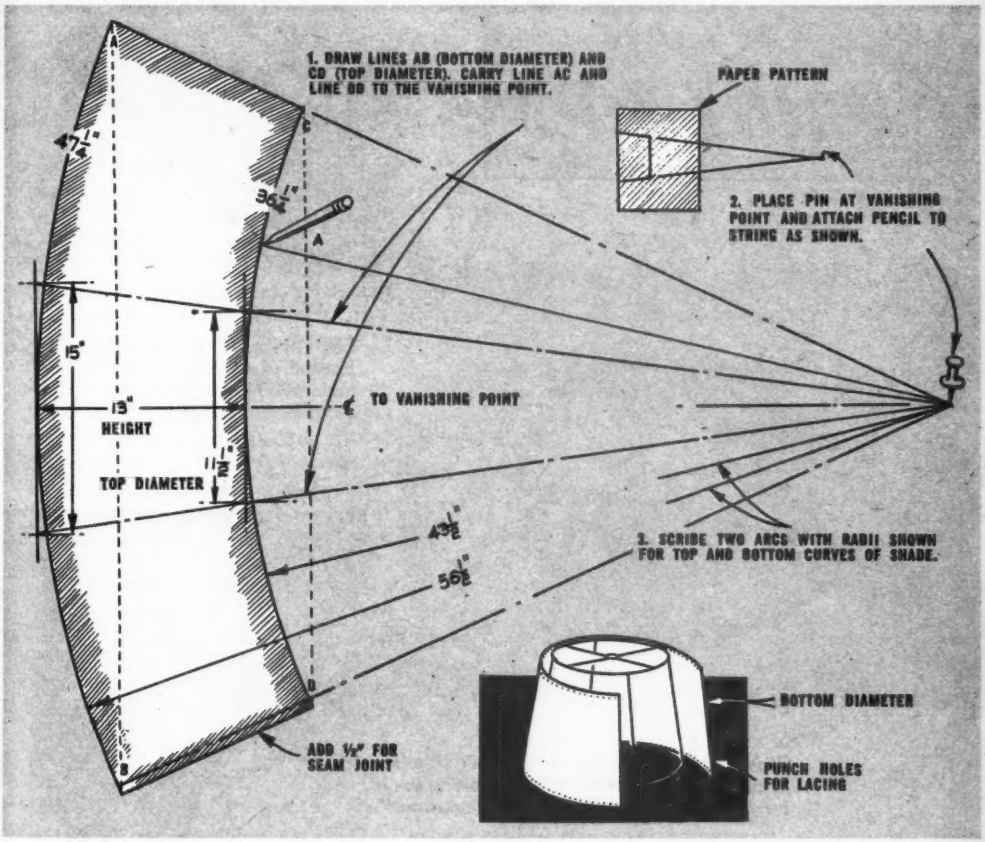


The paper pattern is fastened to the plastic with tape and both are cut with scissors.

15 in.; height, 13 in.; stretch-out arcs, 43½ and 56½ in. The drawing below clearly shows the correct procedure.

The pattern, drawn on tough paper, was fastened to the plastic with Scotch tape, then both were cut to shape. About ½ in. was added to the end for the seam. A cardboard template was used to space the lacing. The holes are ⅜ in. in from the edge and ⅝ in. apart. The holes can be cut with a paper punch or drilled.

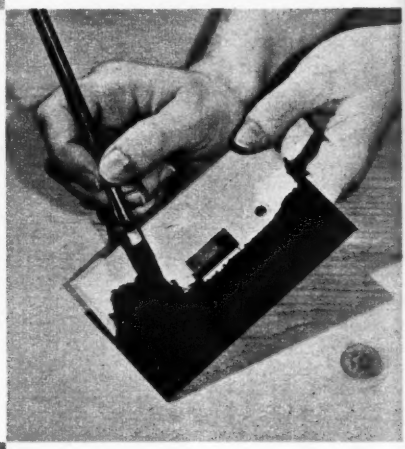
The old shade's covering was removed and its two loops temporarily fastened to the plastic with spring-type clothespins. Lacing was started at the opposite side from the seam and run through all the holes around the top and bottom. [*Continued on page* 156]

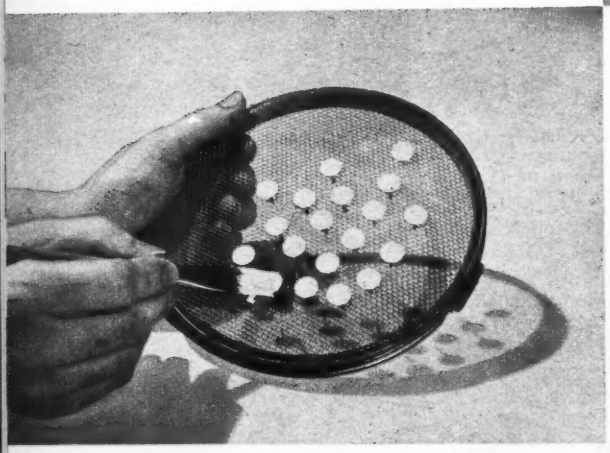


Rinn Brush and Roller Cleaner removes oil and alkyd paints, shellac and varnish. It is worked in, then rinsed out with water.

When painting walls, it's better to paint switch and outlet plates separately; then, if they have to be removed, wall paint won't chip.

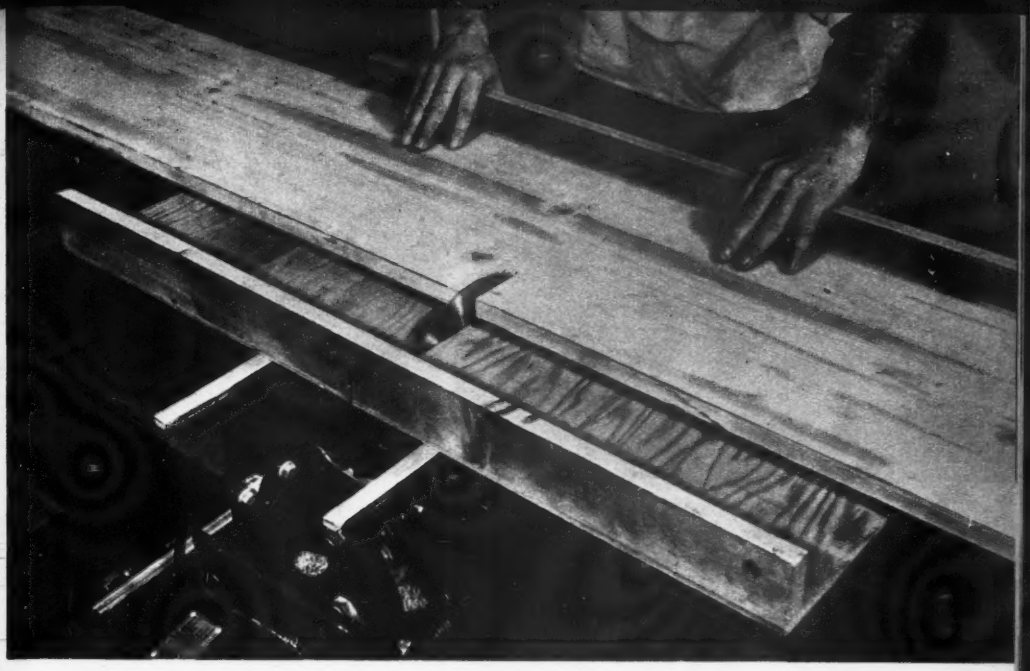
FRESH PAINT TIPS





Left: piece of plastic screening, framed in a hoop, serves to hold tacks which are being painted to match the color of the woodwork.

Right: you can protect your wrist watch from accidental paint splatter and plaster dust by wrapping it with cellophane.



Auxiliary Saw Table

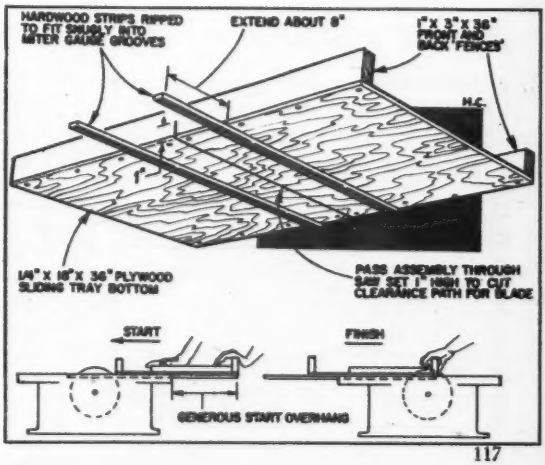
You can increase the crosscutting capacity of any circular saw by making this handy sliding tray.

By Ralph Treves

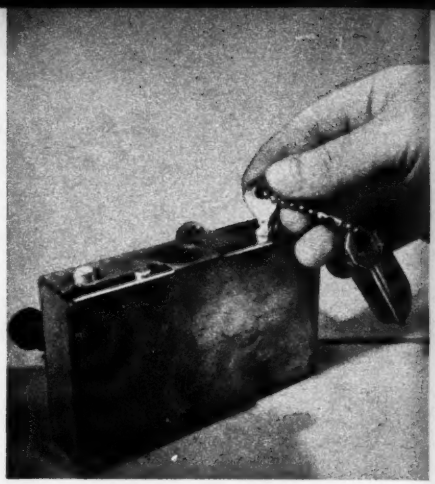
GENERALLY, a circular saw designed for the home workshop does not have a table large enough to permit crosscutting of boards 10 in. wide or more. An efficient way to solve this problem is to make a supplementary sliding carriage like the one illustrated. With it, you can cut boards up to 15 in. wide.

When cutting the plywood tray bottom, make sure that all corners are perfectly square. Then fasten the 1x3s in place, driving screws through from the bottom and countersinking them.

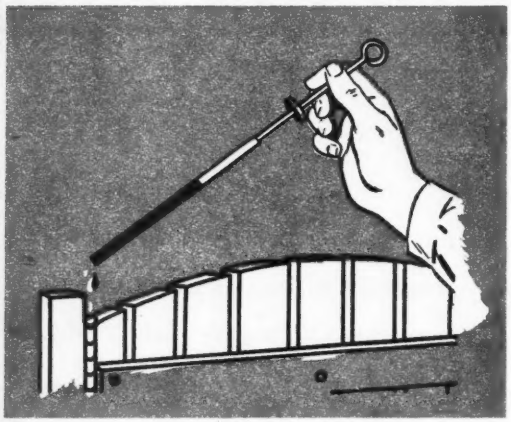
To align the runners squarely on the tray, place the runners in the table tracks and then set the tray on top, lining up the back edge with the back edge of the table. Next drive in a few brads to hold the tray in position; then secure it permanently with countersunk screws. Make sure the screws don't protrude through the bottom. Wax the runners and table tracks so the tray will slide with ease. •



Space concrete patio blocks checkerboard fashion in a lawn and produce an attractive contrast in texture with the grass.



A small screwdriver will always be handy if you shape the end of a steel key with saw and file and carry it on a key chain.



HOME And SHOP TIPS

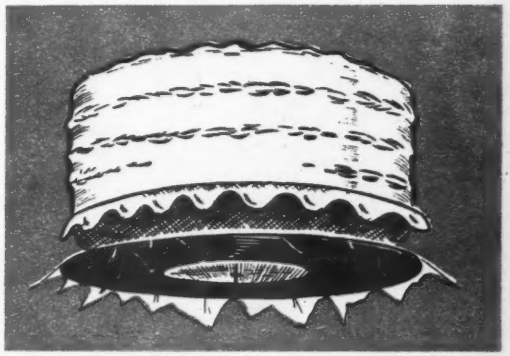
Whenever you're in need of a few drops of oil and can't find your oil can, use the oil level indicator from your car.

FREDDIE FUMBLES

You can demagnetize a tool just by passing it between the prongs of a transformer-type gun with the current turned on.

Applying paraffin to the lower edges of a drawer makes it slide easier. Use heat to flow it right into the pores of the wood.

If donating a cake to a charity sale, use an old phonograph record wrapped in wax paper instead of a good plate.



Send Freddie Fumbles your idea of a good short-cut, time-saver or safety device in your work, whether it be in the home, shop, office or farm. Each tip accepted will be paid for at the rate of $10. Naturally we cannot acknowledge or return the ones we cannot use. However all will be carefully read and evaluated. (Those which we can use in other departments of MI will be paid for at our regular rates.) Please send in your ideas on a post card only. Address to Freddie Fumbles, *Mechanix Illustrated*, 67 W. 44th St., New York 36, N. Y.

Have Fun With a Lie Detector

No use lying or trying to hide your emotions. This little gadget will surely find you out.

By Tony Karp

Couple above is testing strength of affection. Meter shows any change in emotional response.

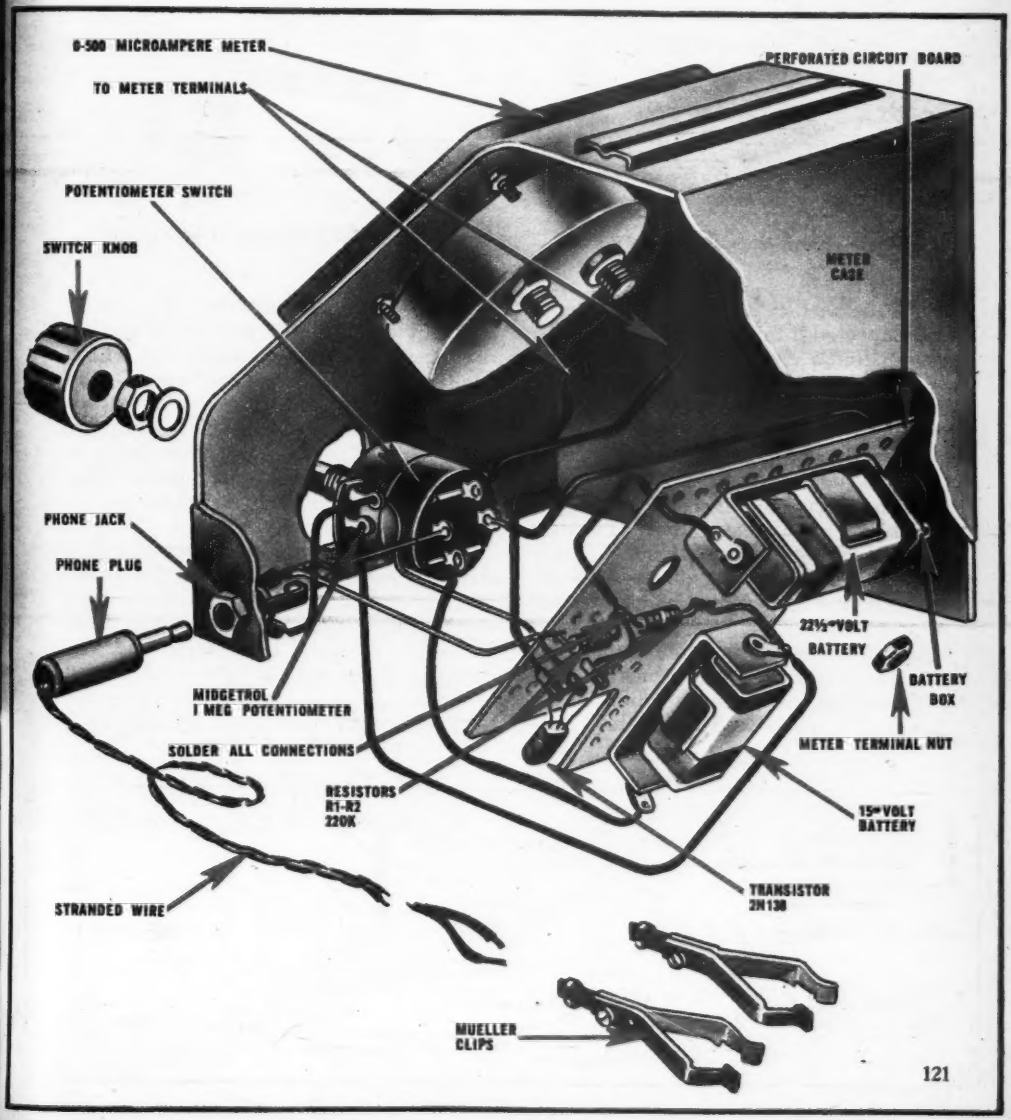
IF YOU really worked late in the office last night you have nothing to worry about if the wife wants to give you a little going over with the help of this lie detector. But, if you were out with the boys, played poker or told her that the smear on your collar is red ink—watch out! This little gadget will give you away.

When a person lies, no matter how slightly, certain physical changes such as an increase in perspiration, body temperature, flow of blood, etc., take place. This increase or decrease in perspiration affects any electricity that may be passed across your body, your fingers in this instance. This change in electrical resistance is then registered on the instrument's meter.

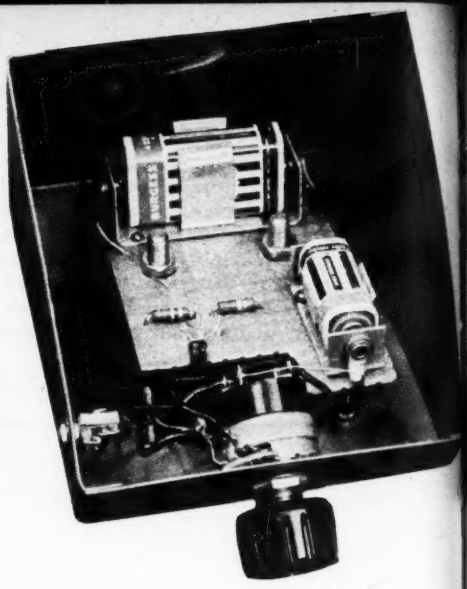
You can have a barrel of fun with

this device by using it as a kissing meter. To use for this osculatory purpose, fasten a clip to the index finger of the man and the other clip to the corresponding finger of the female victim. When their lips touch, the needle will swing to a certain point on the dial. When tried with another partner or with other couples, the needle will invariably swing to another location, as obviously no two people have the same electrical intensity when kissing! It's all in fun so please don't accuse your partner of being a cold

Don't lie, bud. She's got you this time.



Front view of unit shows meter and control.



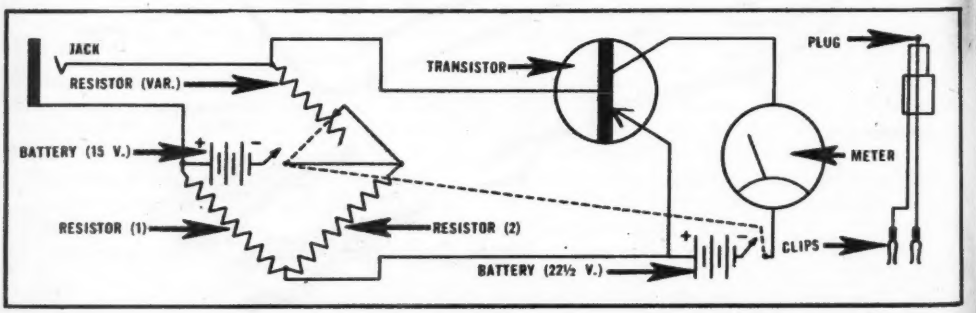
Note arrangement of batteries and transistor.

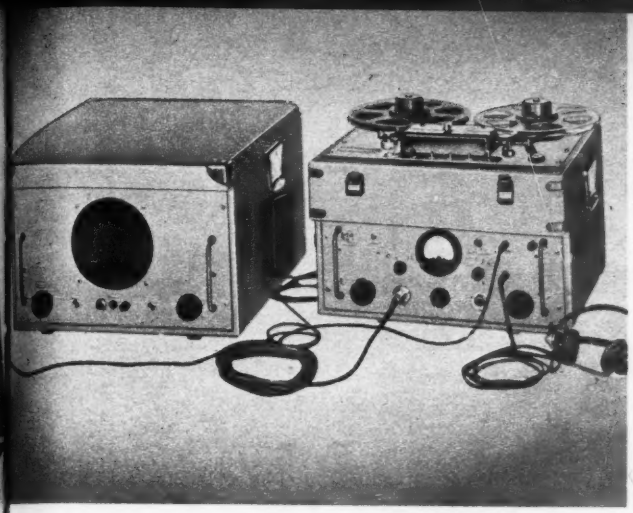
fish if the needle doesn't swing as far as you expected it to.

Our unit's circuit is similar to the Wheatstone bridge used in laboratory instruments for precise resistance measurements. However, for the home builder, there are several drawbacks to the Wheatstone system. The meter must be very sensitive and, therefore, expensive. A battery voltage of at least 45 volts is required. With such a powerful battery there is a chance of burning out the meter if a short circuit occurs. In our system, with the addition of a transistor and another battery, the circuit is actually improved.

The transistor acts as an amplifier between the bridge and the meter. The 2N138 transistor amplifies the feeble current changes 140 times, making an expensive meter unnecessary. Low voltage batteries can be used. The current drain from the second battery is about .5 thousandths of an ampere. The second battery's current drain is about half that. The unit requires only one control and both switches are on this control.

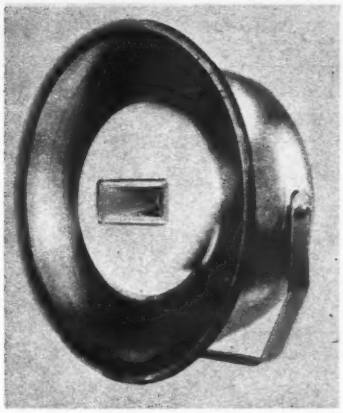
All parts for our detector may be purchased from Lafayette Radio, 100 Sixth Ave., New York 13, N. Y., or from your local radio store. The case, ICA 3996, is made of very light steel and the builder using even a hand drill should encounter no trouble in drilling the various holes. [*Continued on page* 158]





WHAT'S NEW

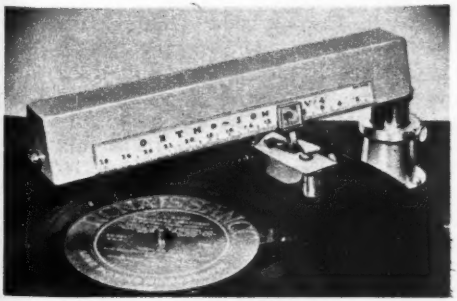
1. Portable tape recorder has 7½ and 15 ips speed; frequency response 30-15,000 cycles ±2 db at 15 ips. Can also be used as public address system.



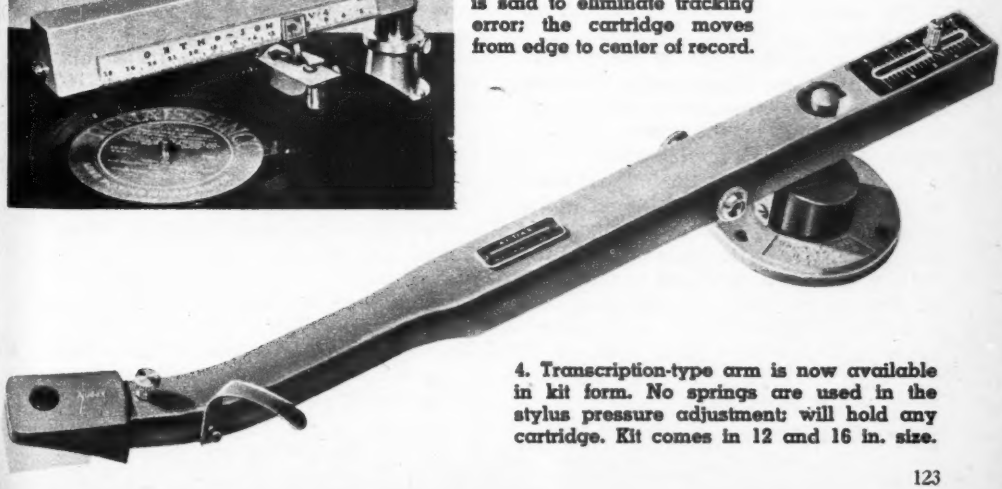
FOR MORE INFORMATION WRITE TO:

1. Telectro Industries Corp., 35-18 37th St., Long Island City, N. Y.; 2. Jensen Mfg. Co., 6601 South Laramie Ave., Chicago 38, Ill.; 3. Bard Record Co. Inc., 66 Mechanic St., New Rochelle, N. Y.; 4. Audak Co., 500 5th Ave., New York 36, N. Y.

2. All-weather speaker features 8 in. single-fold horn for low frequencies. A network provides for frequencies above 2,000 cps to be produced through h-f unit at front.



3. New Orthosonic tone arm is said to eliminate tracking error; the cartridge moves from edge to center of record.



4. Transcription-type arm is now available in kit form. No springs are used in the stylus pressure adjustment; will hold any cartridge. Kit comes in 12 and 16 in. size.

How to Build a Garage

You can add a spacious garage and breezeway to your present home for less than $700.

By David X. Manners

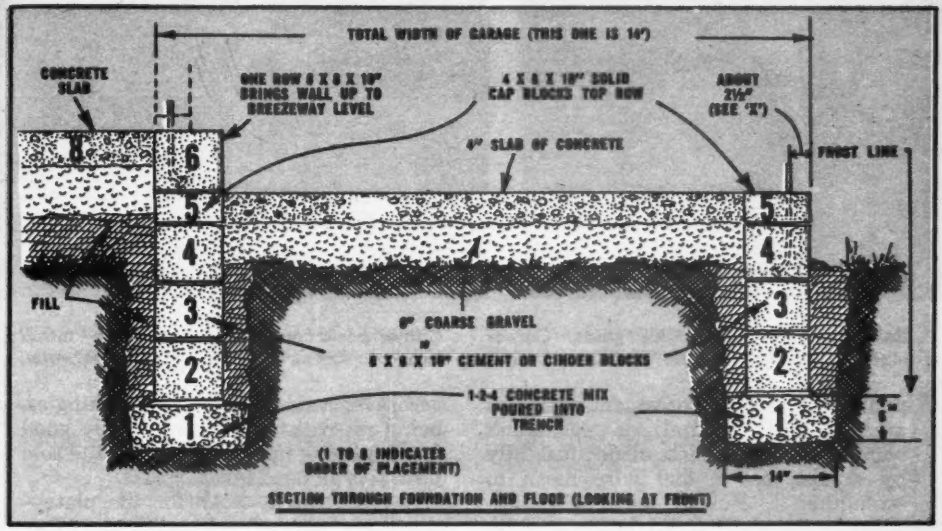
IT TOOK exactly 32 hours to frame and sheathe this garage; two men can do the job in a weekend. If three work at it, they can take time out for a midday siesta.

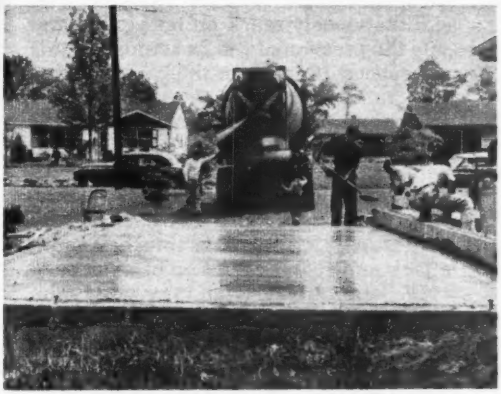
The secret of the speedy construction is accurate squaring, plumbing and leveling to within $\frac{1}{16}$ in. at every stage of the operation. This enables all studs and rafters to be cut in one job lot and walls to be built on the floor—eliminating time-consuming ladder work.

Though the construction shown is for a garage and breezeway, exactly the same technique can be used in framing any addition to your house. Finishing details, such as siding and roofing, can be done as you please to suit your own situation. However, for appearance's sake, make the roof pitch conform to that of your house and line up all windows at the same level.

Garage size is a generous 14x24 ft., big enough to allow a workbench at one end; breezeway size is 6x9. Three cubic yards of concrete went into the foundation footings, 16 in. wide and 8 in. thick, poured directly into the ground just below the frost line. The slab required 4 cubic yards of concrete—a 1:2:4 mix. Cost of the entire construction was $160 for slab and cinder block foundation and $500 for lumber and other materials. Get a building permit before you start construction and be sure you comply with all local ordinances.

Pour the 4-in. concrete slab on a 6-in. bed of packed-down coarse gravel. It is advisable to cover the gravel with roofing paper before pouring, lapping it 4 in. at the edges. This seals out vapor, which can bring rust and deterioration to your car and tools, as well as to the garage structure itself. Many slabs are

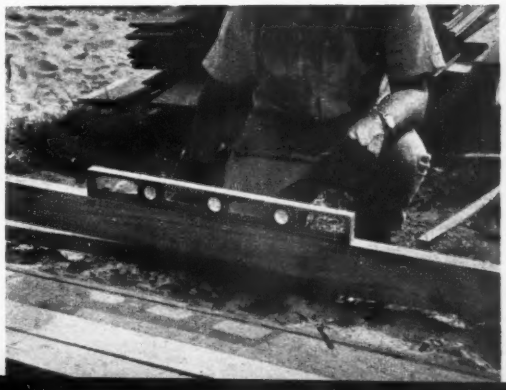




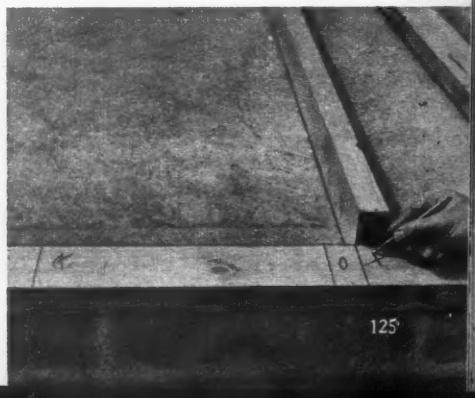
The 4-in. thick concrete garage slab measures 14x24 ft.; breezeway area is 9x6 ft.

Nuts are turned down over anchor bolts in a hole drilled into the 2x4 bottom sole.

Level is taken from stud wall to stud wall. Make sure that there are no bulges on sole.



Positions of wall studs are marked at 16-in. intervals on bottom soles and top plates.



Select straight pieces for studs. Corner studs are omitted in the above operation.

Corner posts consist of a "sandwich" made from two 2x4's, with spreaders in between.

poured without reinforcement but if you are on filled ground, or you don't want to see your slab made unsightly by cracks, use a 6x6 wire mesh to strengthen it. Pull the mesh up to midpoint in the slab after pouring over it.

For drainage it is advisable to slope the slab slightly toward the entrance. Level off the concrete with a straight 2x4. Best finish is obtained with a wood float but wait until the concrete has set fairly stiff before going to work on it.

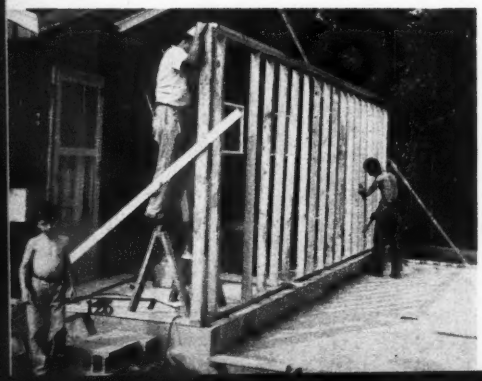
Insert three ½x10-in. anchor bolts along each side of the slab and two at the ends, placed to receive the 2x4 sole or shoe—the bottom member of the wall frame. Bolts hold the garage structure to the slab and keep the walls from getting shoved out of line by accidental bumps from the car. Select your straightest 2x4's for sole members. Brush liberally with Penta wood preservative after drilling holes for insertion of anchor bolts.

It is important that the sole be level. Check the level of each side as well as across from side to side. Wood shingles, being rot-resistant, are especially good for shimming up low places on the sole until it is all dead level.

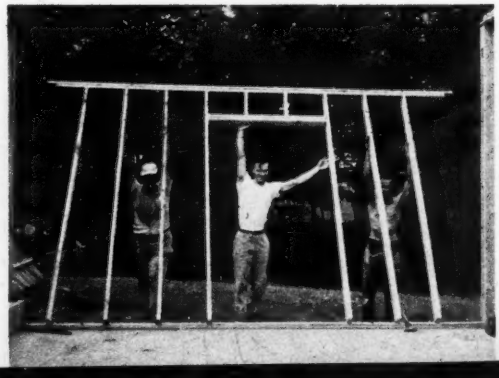
Select straight 2x4's for the plate—the top member of each wall frame. Lay them alongside the sole members and simultaneously mark on both plate and sole the position of the 2x4 studs. Studs are spaced 16 in. from the center of one stud to the center of the next. Studs on facing walls should be located exactly opposite each other. All door and window openings are framed with doubled 2x4's set on edge. These "headers" are supported on each side by jack studs. All openings thus have both a jack and regular stud on each side.

For the outside wall, two 8-ft. 4-in. studs are cut from each 18-ft. length of 2x4. Because of grade conditions in the construction shown, the foundation wall near the house had to be higher and studs for this wall were 7-ft. 8-in., cut from 8-footers. Reserve the straightest studs for use as jacks and

The first wall is raised. Strike studs with hammer to reveal too loose or tight fit.

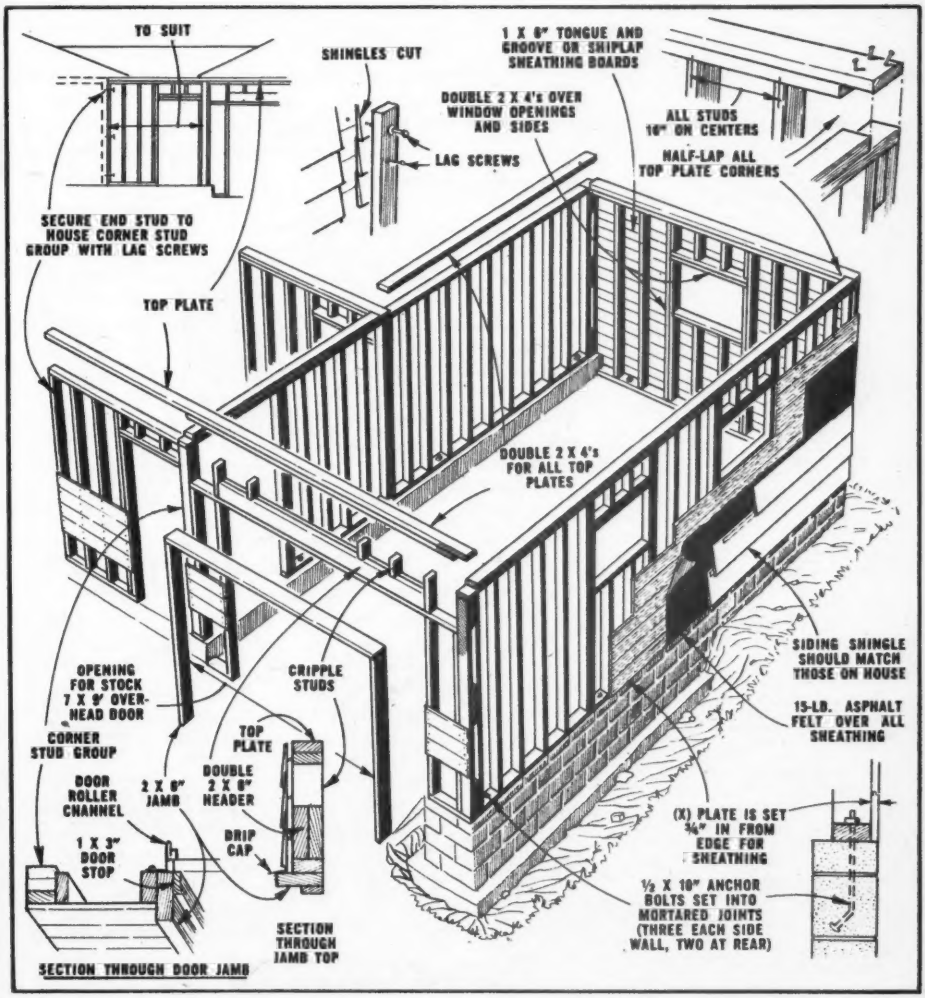


After installing the two side walls, raise the rear wall. Note the longer upper plate.



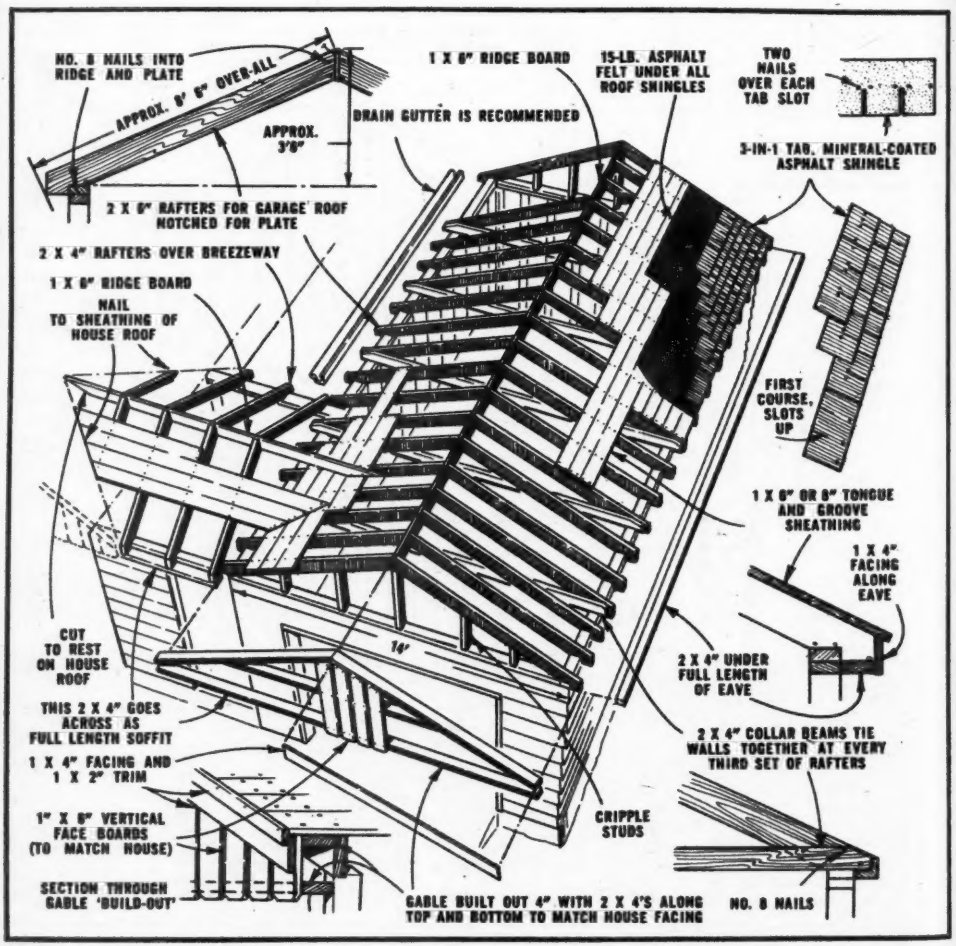
When all walls are in place, use sheathing boards to brace each corner, as shown.

Attach a 2x4 collar beam at every third rafter. Follow drawing for correct dimension.



Temporarily, tack ridge boards to wall and mark off studs for proper rafter placement.

The ridge board, two 12-ft. lengths of 1x6, is raised and rafters are attached, as shown.



After all rafters are in place, install the tongue-and-groove sheathing to the walls.

The roof over the breezeway is miniature version of garage roof, attaches to house.

corner posts. Skip corner studs but attach the top plate to all others at marked positions. Angle an 8-penny nail through the side of the plate into each stud, then toenail two 16-pennies into it. It doesn't matter which of the side walls you frame first. Double the top plate of each side wall frame with a second 2x4, 3⅝-in. shorter at each end. The top plates on the end walls are 3⅝-in. longer at each end, permitting a lap joint where walls intersect.

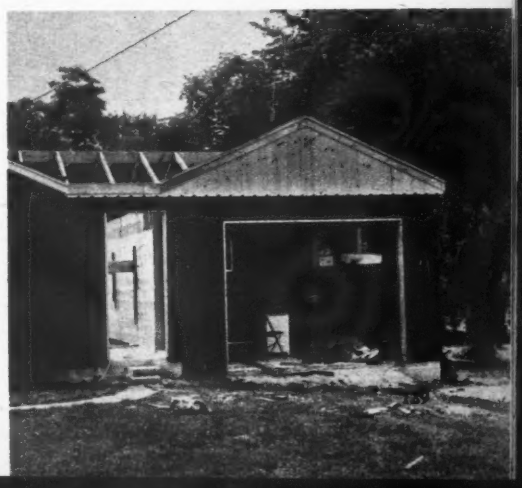
Construct corner posts by spiking together two 2x4's, inserting as spreader blocks between them the pieces left over from cutting up the 18-foot 2x4's; corner posts thus have a thickness of three 2x4's. Place a corner post at each end of the first wall to be raised. Nail each post into position, plumbing it on two adjacent faces. Attach a brace to hold it.

Raise the first assembled wall and nail the extended ends of the top plate to corner posts. Sight along top plate to make sure there are no sags or high places. Shim up where necessary with shingles under the sole. If any studs are high, trim them down. When fit is perfect, toenail studs to the sole with 8-penny nails, placing one nail on each short face of the stud and two on each long face.

Frame the wall for the second side and raise it into place like the first wall. Do not attempt to plumb walls perfectly at this stage. Frame and raise the end wall, then the front. Make a header across the door opening of two 2x6's spiked together. The size of the door opening should [*Continued on page* 156]

Vertical 1x6 in. face boards decorate the front of the gable, should match your house.

View of nearly finished garage shows wall treatment. Doors, etc., can now be installed.



Adjustable Wall Shelves

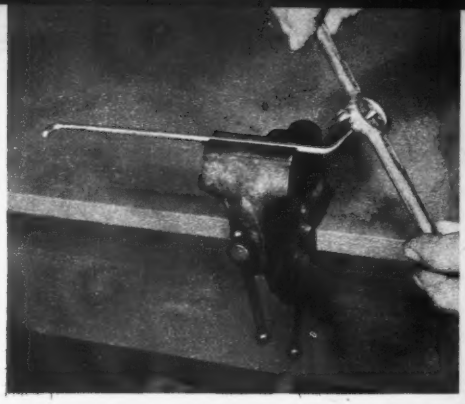
Here's one way to get inexpensive and attractive floor-to-ceiling bookcases.

NEW ideas keep coming along, even on so prosaic a subject as wall shelves. Novel brass hanger brackets are employed in this unit holding the shelves firmly in position and allowing for easy height adjustment.

The system consists of a set of vertical wood standards, drilled to receive the brass supporting rods and hangers. The shelves are notched at the rear to clear these uprights; acorn nuts at the bottom of the shelves hold the brass rods in place.

To start construction, cut the 1x2-in. hardwood standards to the desired length; this can be floor-to-ceiling or less, depending on your requirements. Use a compass to mark off the holes which are drilled into the inside edge of each standard, 1⅛-in. apart. Use a $\frac{3}{16}$-in.

After clamping the brass rod in a vise, bend as shown in the drawing. Thread the rod's larger end to receive the acorn nut.



drill and construct a jig so that the depth of each hole is about ¾-in.

The side supports should not be placed more than three feet apart; they must be plumb and all holes must line up. Fasten them to the wall with fiber plugs or Molly bolts.

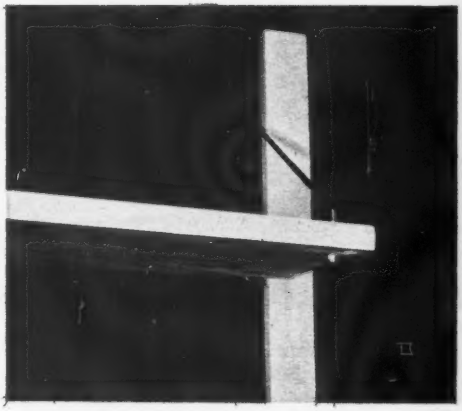
Now, cut your ¾-in. thick hardwood shelf panels, 1½-in. longer than the space between the wall standards. Cut out a ¾-in. deep notch at each rear end of the shelf to clear the standard.

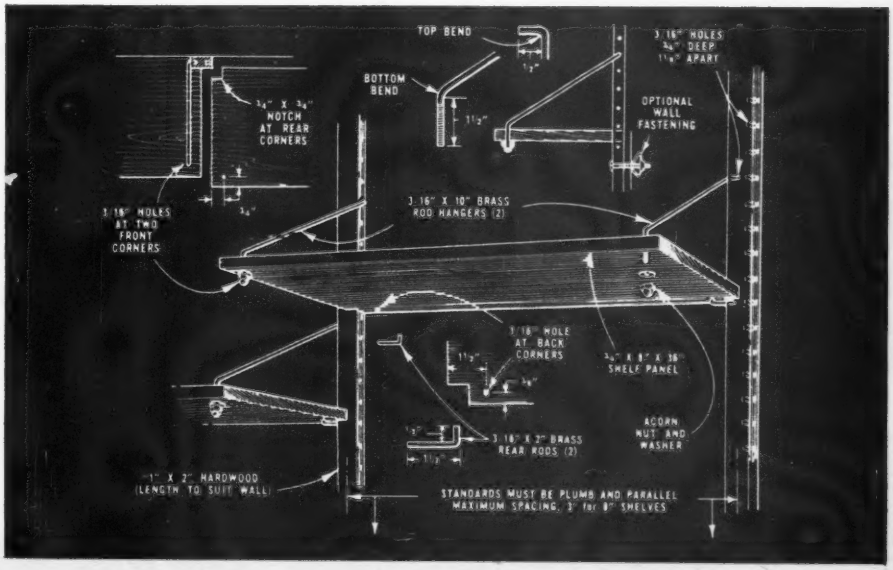
To make the hangers, clamp a 10-in. length of $\frac{3}{16}$-in. dia. brass rod in a vise and make a right-angle bend ¾-in. at one end; 1½-in. from the other end bend the rod to the angle and direction shown in the drawing. This end is threaded to receive the lock nut. Make two of these hangers and try them out on a shelf. If they seem to be all right, use them as a pattern for the rest of the hangers.

The short brass hooks used to support the shelves at the bottom are made from the same stock and receive a 90° bend.

Shelves and uprights can be painted or left natural and finished in the usual manner. For contrast, different types of wood can be used for standards and shelves. •

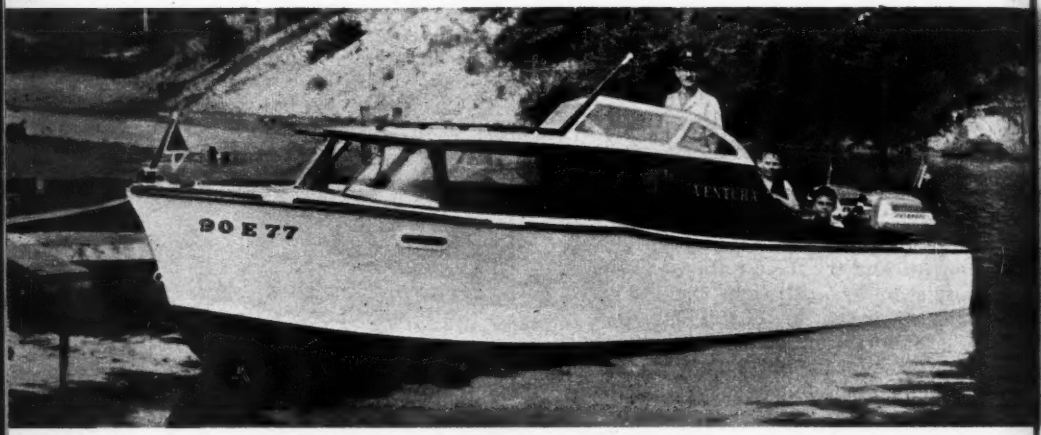
Close-up shows shelf in position, held by the brass hanger. Note small hook used to support the bottom rear of the panel.





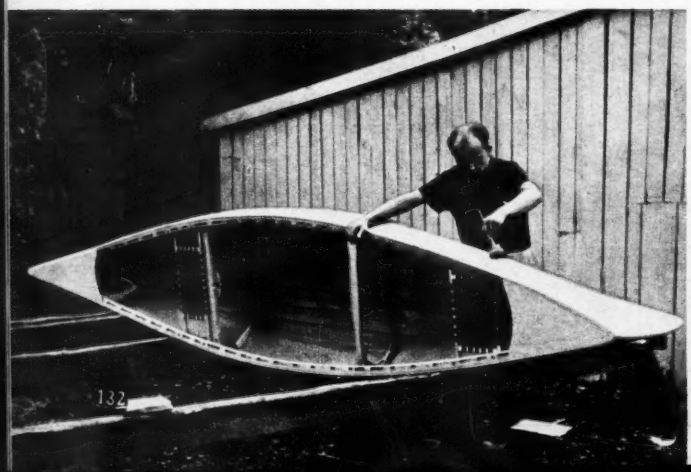
Golden Hammer Award Winners

Each craftsman whose project is shown has received a 24-karat gold-plated Hammer and a Workbench Award Certificate. How about sending us a photo and *full* description of your latest project? If you aren't a winner, you may still receive a 14-karat gold-plated Golden Hammer Tie Bar or MI's Certificate Of Merit. Photographs of you and your workshop are also eligible for an award. Send entries to MECHANIX ILLUSTRATED Golden Hammer Awards, 67 West 44th Street, New York 36, New York. If you want entries returned, please enclose postage.

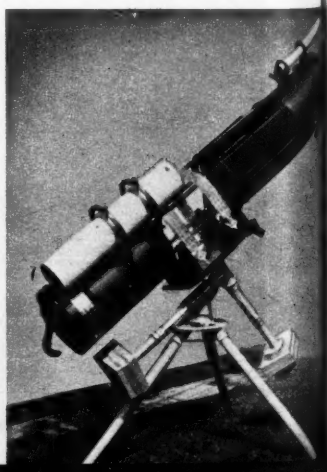


Cabin cruiser, powered by two 25 hp outboards, built from MI plan No. B-208 by E. A. Danbrook, Aylmer, Ont., Canada. Hull is planked with ½-in. cedar, covered with Fiberglas; cabin sides are mahogany plywood.

Behind the Iron Curtain craftsman Wolski Martin, Krakow, Poland, sends us this photo of his plywood-covered canoe. He says that this type craft is practically unknown there.



Reflecting telescope took 13 months to build. Over 200 hours were spent on grinding and polishing the 12½-in. mirror. Total cost $210. Roger Bland, Hollywood, Calif.



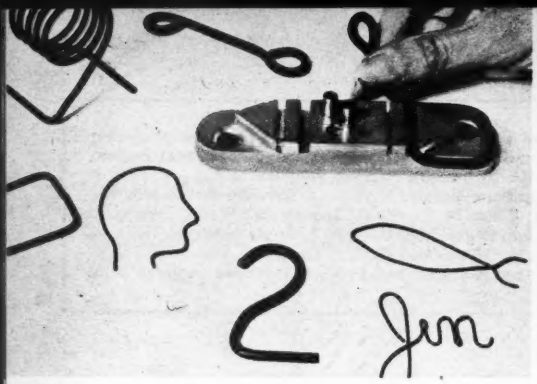
The following craftsmen have been awarded GOLDEN HAMMER TIE BARS for their projects: Jim Conner, White Rock, B. C. . . . Lt. (jg) Donald E. Lloyd, USN, Milton, Fla. . . . Michael Peczek, Hammond, Ind. . . . A. L. Cooper, LaGrange, Ga. . . . Robert Rempel, Petaluma, Calif. . . . John J. van Tol, Rotterdam, Holland . . . Faye W. Hilbert, Buffalo, N. Y. . . . Edward Battocchio, No. Pelham, N. Y. . . . Leo Thibodeau, Moncton, Canada . . . T. C. Tanner, Ft. Worth, Tex. . . . John R. Maldet, Pittsburgh, Pa. . . . Dick Fredlund, Puente, Calif. . . . B. T. Smith, Lubbock, Tex. . . . Donald Fader, Bartonville, Ill. . . . H. T. Wilson, Jr., Greensboro, N. C. . . . Roger G. Skillestad, Pekin, Ill. . . . James R. Brown, Edgewood, R. I. . . . Fred Harrison, San Pedro, [Continued on page 157]

Knotty pine walls, cabinets and Formica-topped counters are part of the "dream" kitchen made by P. Angellis, Wollaston, Mass. This was the builder's first project.

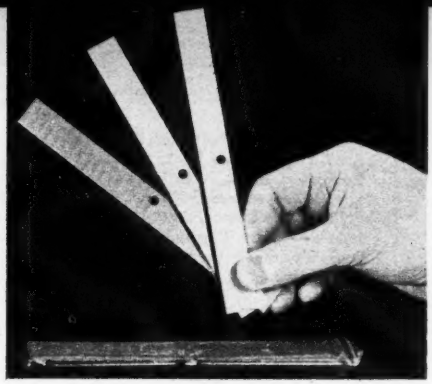
Midget racer built by W. Janke, Westbury, N. Y., for his six-year-old son, uses 1½-hp Continental engine. Body is aluminum sheet over welded water pipe and conduit.

Hi-fi cabinet made of ¾-in. mahogany, houses 10-watt amp. and pre-amp., Garrard changer, Lansing 8-in. speaker and AM tuner. Neil Rawlins, Deep Cove, Van., Can.

Hutch cabinet is made of knotty pine with an antique finish. Project shows excellent craftsmanship and attention to details. Oscar M. Sebastian, Freeport, Long Island.



1. New wire bending tool, Hefty Bender, is an aluminum casting, can be used to shape wire into a great variety of useful forms.



2. Disposable jointer-planer blades are made of Swedish carbon steel. Price is less than the cost of reconditioning old blades.

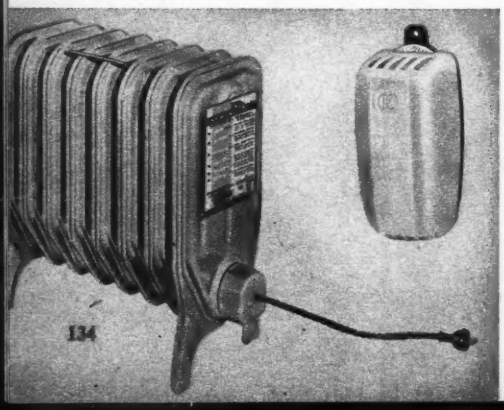
Hardware Store

For more information write to:

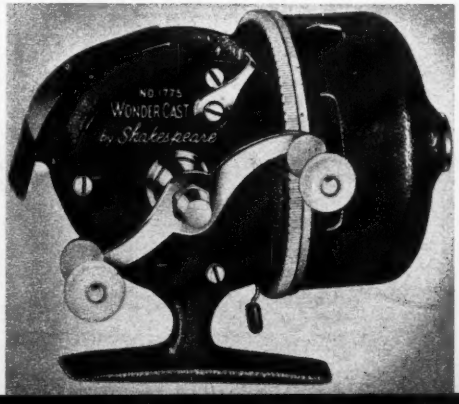
1. Little Beaver Industries, 38845 Mentor Ave., Willoughby, Ohio; 2. Sprunger Bros. Inc., Topeka, Ind.; 3. Southern Screw Co., P.O. Box 1269, Statesville, N. C.; 4. Reed Associates, Inc., 500 Fifth Ave., New York 36, N. Y.; 5. Shakespeare Co., Kalamazoo, Mich.; 6. D. Damar, 835 Newark Ave., Elizabeth, N. J.; 7. Allway Mfg. Co., 1613 Olmstead Ave., New York, N. Y.; 8. American Machine & Foundry Co., AMF Tools, 224 Glenwood Ave., Bloomfield, N. J.; 9. Lake Zurich Metal Prods., Lake Zurich, Ill.; 10. Phillips Mfg. Co., Inc., 2816 Aldrich Ave. S., Minneapolis 8, Minn.; 11. X-acto Inc., 42-41 Van Dam St., Long Island City 1, N. Y.; 12. Rodale Mfg. Co. Inc., Emmaus, Pa.

3. Home-shop screw assortment carries screws of many types and sizes. The carton comes with screw gauge and instructions.

4. Portable electric steam radiator with automatic wall thermostat has eight sections, can be used for rooms up to 12x15.

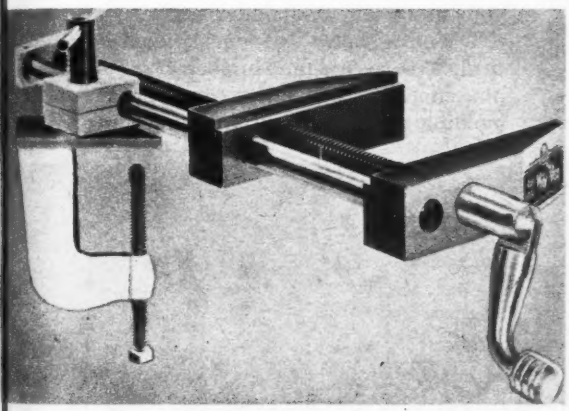


5. Spin-type casting reel features a machined spool, adjustable drag, brass gears, 6-pound line and 4 to 1 retrieve ratio.

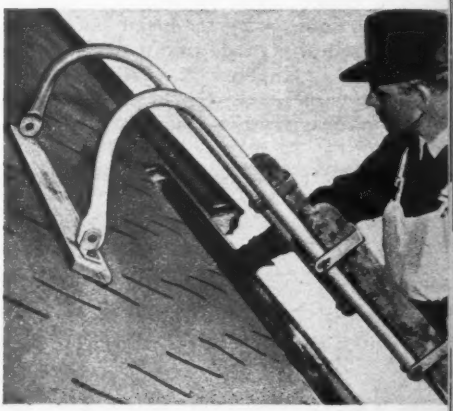


6. Hand-decorated ceramic cake tray has Swiss music box that plays "Happy Birthday." The 10-in. dia. tray rotates as it plays.

7. Paint scraper locks in 8 positions, allows you to scrape in tight corners; 4 cutting edges for rough and fine scraping.



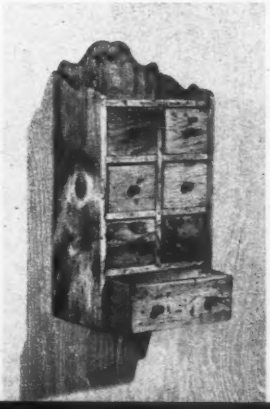
8. This versatile vise locks at all angles, swings 360°; jaws open to 7-in. Can be used in drill press, as a clamp, on bench, etc.



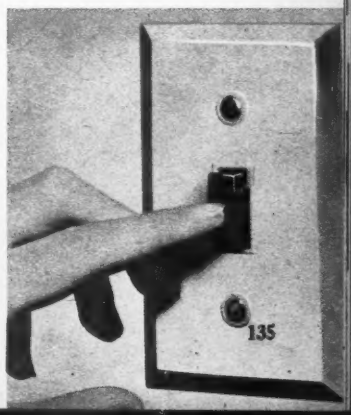
9. Sky Hook, a welded tubular steel attachment for your ladder makes for safer working around the house, eliminates sway,

10. External tank-type engine preheater for trucks or cars gives easy and quick below-zero starting, operates off 115 v.

11. Colonial spice box is made from a kit of precut pieces with guide marks for nails; special finish gives it an antique look.



12. New push button wall switch fits all standard outlet boxes. Comes in single, double-pole, 3-way and 4-way models.



Radiator Cabinet

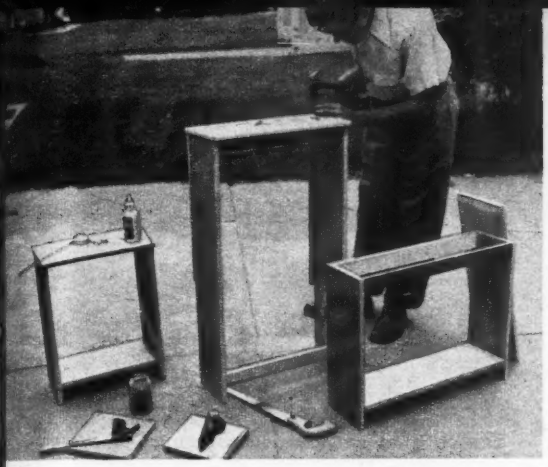
Easy to build, these units cover unsightly radiators, provide valuable storage space.

IF YOU'VE ever built a simple box, you probably have enough experience behind you to build a handy radiator enclosure and storage unit similar to the one shown. It's so easy and the cost is so low, you'll wonder why you've tolerated unsightly, dusty radiators and lack of storage space in your bathroom until now.

Since sizes of radiators and space available vary in every household, no attempt is made in our drawing to give specific dimensions. With variations to fit your needs, the basic design can be followed rather closely.

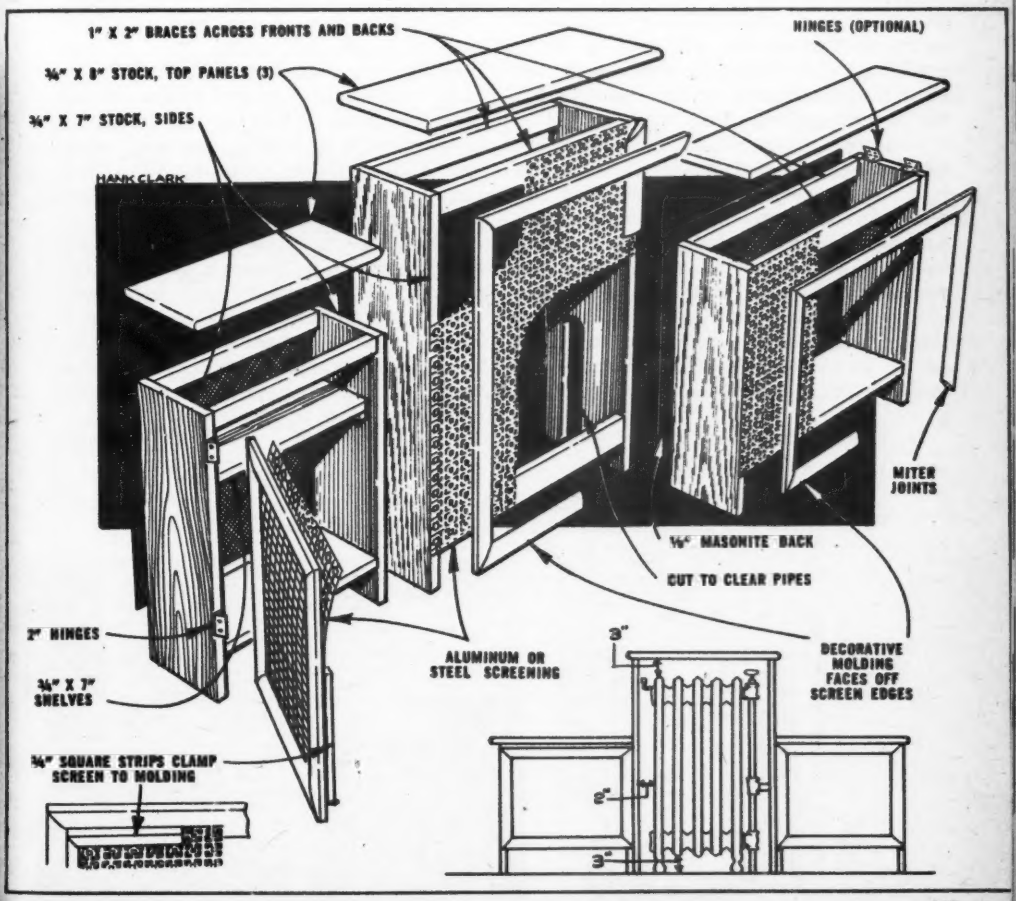
To begin, measure up your radiator; add 2-in. to each side, 3-in. to the top and 2-in. to the front (from wall). These measurements will be the inside dimensions for the radiator enclosure. Allow an unobstructed 3-in. across the bottom front of the enclosure for air circulation. To this basic unit, add the adjoining cabinets, hamper, etc. to conform to your needs and available space.

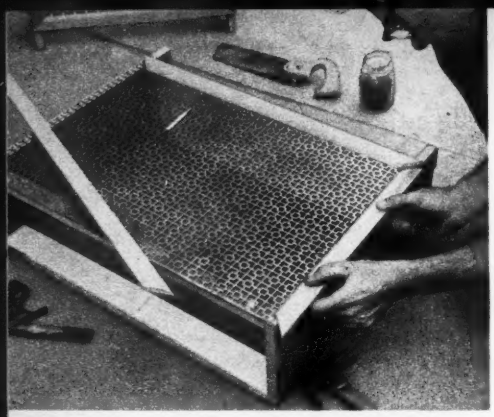
The units shown were constructed entirely with secondhand lumber (¾x8-in. pine shelving) with the exception of the molding strip. Aside from being more



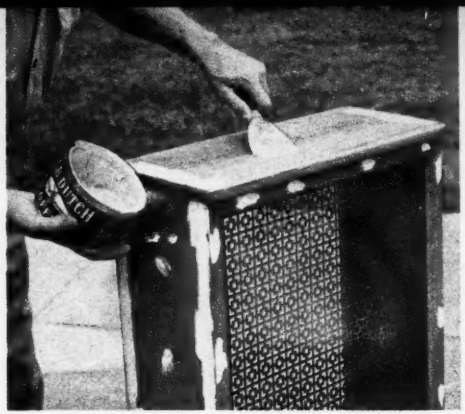
The pieces are best constructed from well-aged lumber to minimize heat warpage.

Aluminum or steel screen material comes in many decorative patterns, is easily cut.





Flathead nails attach grill to unit. Neat 45° miters in molding add professional touch.



Shellac goes on nail heads and all other depressions. Follow with coat of Spackle.

economical, by using old lumber the danger of warping from heat is minimized.

Cut the boards to size, join with glue and nails as shown in the drawing. Make sure that areas where joints will butt are scraped clean of any old paint before applying glue. You are now ready to take measurements for the amount of metal grill and molding required.

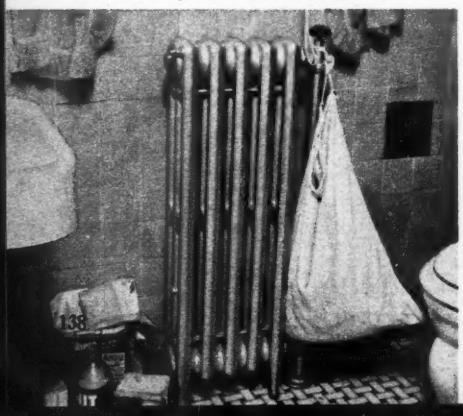
The steel or aluminum grill material can be purchased at most hardware or building supply houses. Supplied in widths of 2, 3, and 4 feet, it is usually sold by the square foot. Cut the grill ⅛-in. shorter than the outside dimensions of the unit, using a tinsmith's shears. With 1-in. flathead nails, attach the grill to the unit, applying one nail every 5 or 6 inches. Miter corners of molding strip and nail into place over the grill.

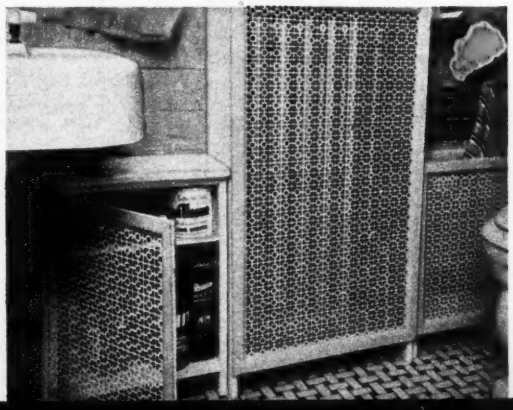
Now the unit is ready for finishing. Depress all nails with a nail set and apply a coat of shellac to these and any other depressions. Follow-up by filling in the depressions with Spackle. Be sure to Spackle the space between the molding and the sides of unit caused by the thickness of the metal grill. When Spackle is dry, sandpaper flush with the wood and apply a coat of shellac to the plastered areas. When this has dried, apply two coats of shellac over the entire job, grill included, sanding with fine sandpaper between coats. Fnish with a coat of good paint.

When the unit is ready to be placed over the radiator, attach a piece of aluminum foil to the entire back and inside top of the radiator unit. This will serve to deflect and direct the heat out through the grill. Although the units shown are backless, if desired, ⅛-in. Masonite can be used to close up the backs. •

—*R. J. Capotosto*

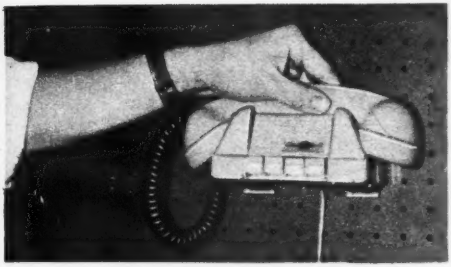
Photo at left shows bathroom before installation of units. Right, the whole area is transformed to give it neat and functional look.





Home Intercom Systems

[*Continued from page* 113]



Push-button intercom is made by Connecticut Telephone Corp. of Meriden, Conn. Cost is $27.50 per phone; $19.50 for AC power pack.

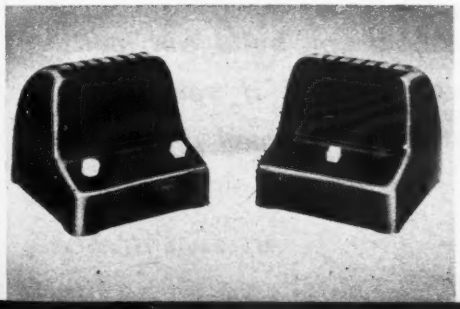
munication between some rooms and only one-way between others. In cases where two-way communication is indicated, decide if you want either station to be able to originate calls or only one.

One way to help decide where you need communications and what kind you need is to make an estimate of how much time various members of the family spend in each room. Obviously those rooms in which considerable time is spent get the nod for two-way set-ups. Also figure on walking distances, remember that one purpose of an intercom is to save footsteps. In multi-level houses it's a good idea to have at least one master-station on each floor.

If you live on a farm, you should have master-master communication between the farmhouse and the barn. If you want to cover a wide outdoor area with a message you can install a weatherproof, trumpet-type speaker.

The location of master units is very important. Certainly one should be installed in the kitchen, the nerve center of the average American home. Another good place for a master is in the main bedroom. And you may want one in the bathroom—to prevent having to race half-clothed and dripping wet to the front door. Near the telephone is another good place to put a master in order to relay phone messages to the proper person.

Master-master system made by Challenger Amplifier Co. of New York 14, sells for $43.95 with 50 ft. of cable. Will work on AC or DC.



Music Systems

The use of intercoms tied into radio or phonographs, which is possible with many units, is one of those yes-but situations. The difficulty is that while such arrangements are adequate for voice transmission and reception, they are not entirely satisfactory for music.

The reason for this is that the small speaker-mikes are of high efficiency but necessarily low in audio quality. A true hi-fi speaker is just the reverse, low in efficiency but high in quality. If you are interested solely in a music distribution system, better forget intercoms and go for a multiple speaker arrangement.

Set-ups of this kind are simple to install and require only the requisite number of speakers, baffles and wire. You can hook your speakers to an amplifier or to the output stage of a radio or record player. In series, the audio output of the amplifier is divided among all the speakers in the string. In the parallel arrangement, each speaker receives and must be able to handle the full output of the amplifier.

Phasing Speakers

In the series or parallel hook-up it is important for all the speakers to be identically phased. You can make this check with a flashlight battery. Mark the voice coil terminals of one speaker *plus* and the other *minus*. Now touch the positive battery lead to the speaker plus terminal and the negative lead to the minus side. Note which direction the speaker cone moves—forward or backward. Now repeat the operation with the unmarked terminals of the second speaker. If the speaker cone moves in the same direction it did when you tested the first speaker, mark the voice

[*Continued on page* 147]

Plywood Tips for The Boatbuilder

By Bob Whittier

Photo courtesy of U-Mak-It Products

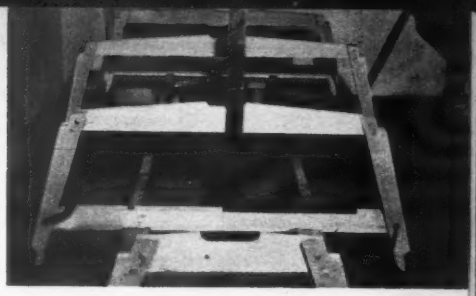
The boat you build can look factory-finished if you know how to use plywood properly.

IN CELLARS and garages everywhere boats are being built in greater numbers than ever before. For the most part they represent first attempts at boatbuilding by do-it-yourselfers. While most of these boats receive painstaking attention, too many of them fall short of perfection. This is because the novice, no matter how careful he is, just isn't aware of all the little tricks the expert has at his command. A slight flaw here, an odd detail there, and what could have passed for a factory-finished boat is branded as homemade for life. Here, then, are some professional tips which will do much to help you turn out a fine boat.

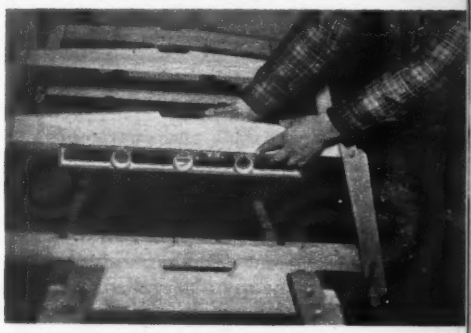
Virtually all kit boats and a large percentage of boats built from plans are planked with waterproof fir plywood. Obtainable in uniform quality everywhere, it is light, strong and enables the builder to produce a good-quality craft at moderate price. If you buy a kit you may feel sure that the plywood it contains is waterproof and suitable for boatbuilding. However, if you're buying raw materials from a lumber yard, a few words on plywood types and grades will be good insurance against mistakes.

Fir plywood is made in interior and exterior types. Interior type has no place in boatbuilding because the glue will not stand soaking in water. Exterior type, however, is bonded with a glue that is completely waterproof; samples have been immersed in water for two decades without trace of separation. When buying fir plywood, look along the panel edges for the brand, "EXT-DFPA"; it is the guarantee of the Douglas Fir Plywood Association that the material is waterproof.

As differentiated from types, plywood is also graded according to the quality of surface veneers. Most boatbuilders prefer grade AA, meaning that both sides of the panels are sound, knot-free, smoothly sanded and well-matched veneers. For some applications grade AB, with the B side showing minor flaws and round patches which do not affect durability, may be used at a slight saving. There is also a grade C surface which is unsanded and has unpatched flaws. It is useful for decking, floorboards, etc., where one side will be out of sight. The complete identifying brand on the panel edges will read,

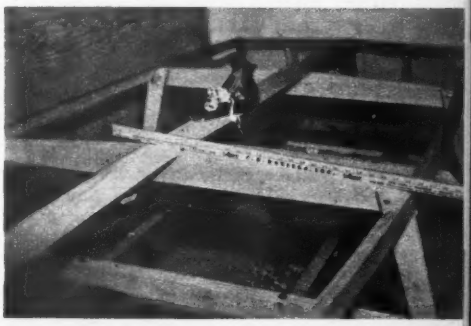


Use square to be certain that each frame is centered perfectly on jig.

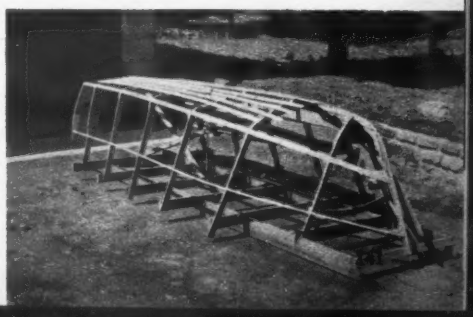


Be sure all frames are leveled. One frame out of line can distort boat.

Use yardstick as guide when planing frames to proper bevel for planking.



For good results, it's important to have jig and framing rigid and true.

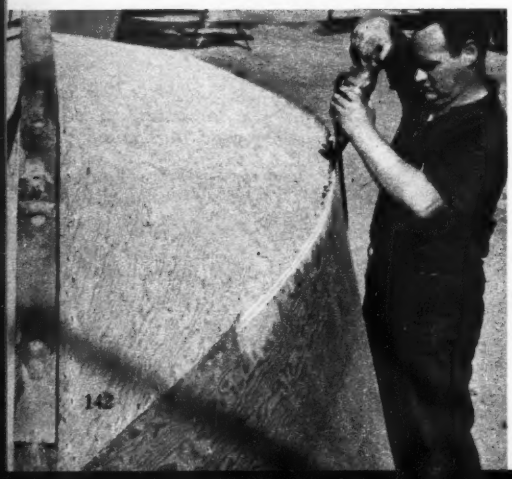


If voids are found in ¼-in. plywood, fill them in with glue and thin wooden strips.

"EXT-DFPA-AA" or AB, etc. Numbers following these symbols are factory code numbers and have no significance to the boatbuilder.

Some people are confused about "marine" plywood and have the impression that it is something pretty special. In a way it is. Though the same glue is used and it carries the same brand, it differs from exterior plywood in that the outer plies are more rot-resistant heartwood and the inner plies have no open knotholes and are carefully butted so as to eliminate voids as far as possible. Thus marine plywood is stronger and can be bent onto a boat with less danger of cracking or forming ridges where voids would concentrate the stress. Only a few firms, such as Harbor Plywood Corp., Aberdeen, Washington, make marine plywood.

Power-driven screwdriver speeds up work, but be careful using it on thin plywood.



Voids from $\frac{1}{16}$ to ¼ in. wide do exist in the inner plies of exterior plywood. While this is of no consequence in heavy stock, it can cause trouble when ¼-in., 3-ply stock is bent onto the bow sections of a boat. If you cannot obtain void-free plywood, rip some scrap wood into splinters and plane them down to fit into the holes. Then run thinly-mixed glue into the spaces and push in the splinters. This will make the plywood practically trouble-free. Use a long thin wire to probe for depth and obstructions.

The jig which holds frame members in proper position for assembly is vitally important. If not accurately lined up and rigidly built, various parts will not go together properly and the hull will be out of shape. It must not flex or warp when longitudinal members and plywood are applied. Unfortunately, some kits skimp on the matter of sturdy jigging and it would be a good idea to stiffen up a frail-looking jig with longitudinals and diagonal bracing. If your work floor is not level, take enough time to be sure your jig is shimmed and blocked up really true.

When all frame parts have been assembled on the jig, go over everything carefully with a carpenter's level, square and plumb bob to make sure each member is level when seen from ahead or astern, vertical when seen from the side and at right angles to the keel or centerline. An hour spent in checking alignment of the frames, stem and transom will insure that a hull is shaped exactly as the designer intended it to be for top performance.

After the frame members have been glued and screwed together, frame stock must be beveled so that the plywood will lie snug and flush at all points. Get a yardstick and place it on the framework to represent the plywood and use it as a guide for planing and rasping the framework to obtain good joints. Watch for high spots in the framework which may put bulges or ridges into the outer surface of thin

plywood. Also look out for hollows into which screw heads can pull the plywood. Ridges and depressions caused by poor fitting of plywood against the frame are difficult to see on an unpainted hull, but they'll show up badly after a glossy paint job — and then it's too late!

While beveling frame members, stop and think of what is going on. Good carpenters think square and plumb, but good boatbuilders have to think in terms of angles, bevels and curves! For example, suppose we are beveling the keel and chine pieces to receive the bottom plywood. The yardstick may show that a bit more wood ought to come off the chine to get a flush fit, so more wood is planed off. Finally the fit is perfect in the transverse sense and we step back to look things over. To our dismay we might find that we've gone and planed a bad hollow in the fore-and-aft sense! That will throw a hook into the bottom which will harm appearance and performance. Try hard not to concentrate on one thing so much that you lose sight of its relationship to adjoining members.

The transverse members of a vee-bottom plywood boat usually exhibit a slightly curved or bulged cross section toward the bow. When plywood is bent and twisted down onto most vee bottoms it usually wants to belly somewhat and the frames of skillfully designed boats are cut to accommodate this tendency. Do not make the mistake of trying to use plywood planking on a boat design which was intended to be planked with many narrow strips of solid wood—you will certainly come to grief. Plywood sheets will bend in one direction and cannot be forced to do otherwise. Trust your designer's knowledge!

A typical small plywood boat will contain 500, 1,000, or even more wood screws. Trying to build it with a plain screwdriver will give you a cramped wrist and a raw palm before the job is half done. You'll save time and suffer less if you buy a ratchet-type screwdriver. Drill pilot holes for screws with one of those new gadgets which drills and countersinks simultaneously.

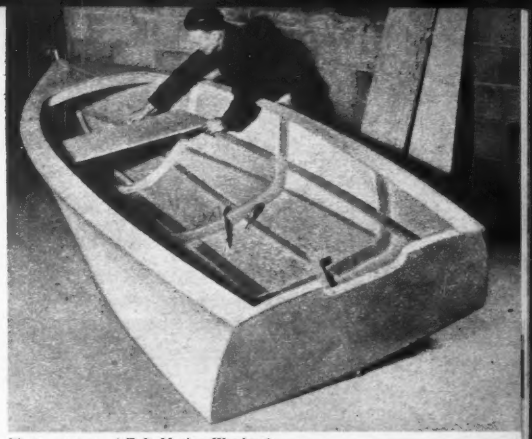


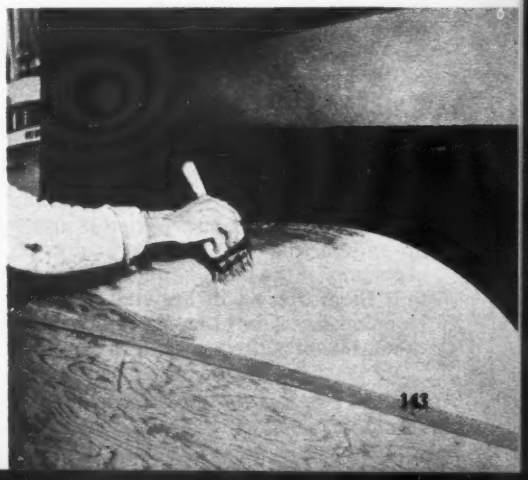
Photo courtesy of Taft Marine Woodcraft

Checking a seat for proper fit. For good results, attention to detail is important.

An electric drill is a wonderful time-saver. However, power-driven screwdrivers are a bit risky to use on thin plywood because they zip screws in so hard and fast there is danger of driving screw heads clear through. Screw spacing is a matter of common sense. If they are ten inches apart in thin plywood, the plywood may tend to bulge up between screws. Get them close enough to hold the plywood down evenly and put adequate pressure on glue or seam compound. Usually, 3- to 5-in. spacing works out well on small craft.

When bending plywood onto the bow of a boat, it helps to soak the outer surface with [*Continued on page* 152]

Marine undercoater does much to improve a paint job; it is applied after the sealer.



Does Your Car Really Need An Oil Filter?

Heavy sludge and grit in oil pan cannot be drained out, should be removed manually.

After the pan is cleaned, be sure to apply gasket cement before replacing the gasket.

WHEN the eager lad at the corner filling station asks if he should check your oil he is thinking largely in terms of quantity. His boss goes a little further by considering quality. The latter knows that it is just as important that the oil be clean as well as "full." Checking the oil calls for the services of three of our senses.

With our eyes we see if the level is high enough and if the oil looks clean. We can tell if the oil has good body by feeling a sample of it. And we smell the oil for evidence of excessive contamination with gasoline, carbon, lead and various other by-products. But a "sixth" sense is needed to keep us from drawing too hasty a conclusion.

Take detergent oil as an example. After a relatively short period of use in an engine that is somewhat fouled up, especially if the oil is being used for the first time, there will be what seems to be an ominous darking. It can be easily taken for very dirty oil but it is merely evidence that the oil is picking gummy deposits from engine parts. Such organic matter is dark in color. It is then carried in suspension and eliminated from the oiling system when the oil is drained.

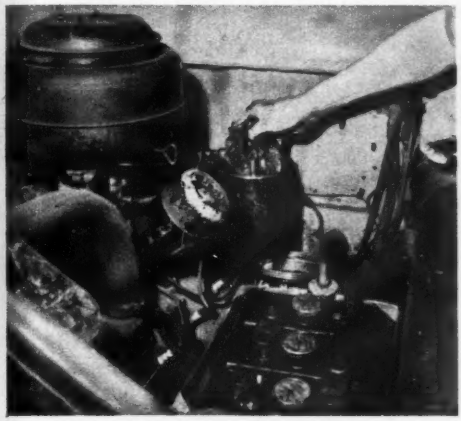
Filter elements do not trap these deposits and it is just as well because the primary purpose of an oil filter is to remove dirt and abrasives such as minute metallic particles which the circulating oil picks up. Organic matter which causes valves and rings to stick, and hydraulic valve lifters to be faulty in their action, does no harm to the engine while being circulated in the system. But if a dirty engine is being cleaned up internally it is best to drain and refill the crankcase after 300 or so miles of service. Your guide will be the darkness of the oil. If the oil darkens quickly you will know that there is a lot of organic matter being removed and that more fresh oil will be needed to complete the clean-up and to keep the

Do you know the significance of dark oil?

Does a good oil filter remove detergents?

By Frederick C. Russell
Member, Society of Automotive Engineers

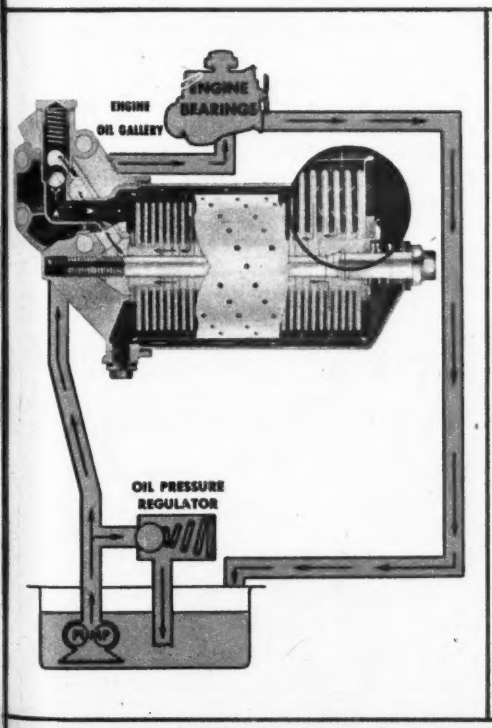
Note heavy sludge accumulated at top of oil filter. Clean and insert new cartridge.

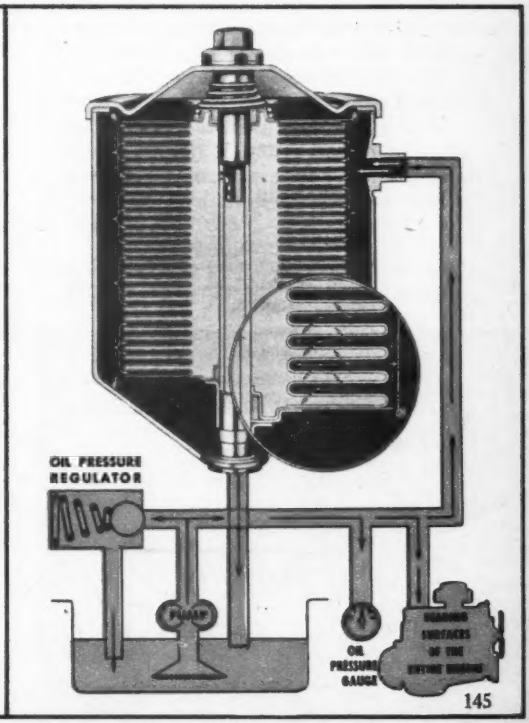


Full-flow oil filter system.

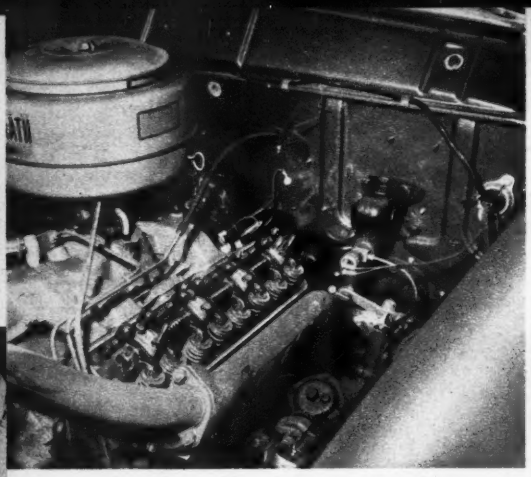
Never use kerosene to flush your oil system. Always drain crankcase when engine is hot.

By-pass (partial flow) oil filter system.

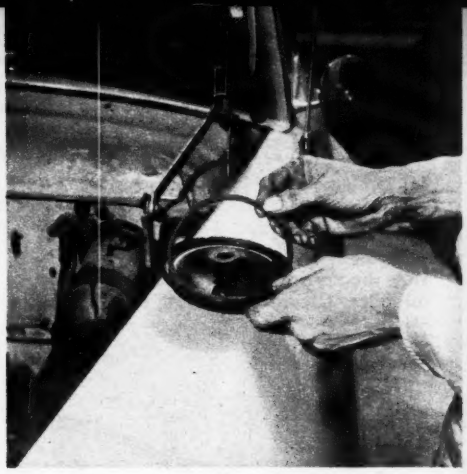




Drawings courtesy AC Spark Plug Div.



Overhead valves are easy to clean. Remove cover and check for sludge around springs.



When replacing filter housing cover make sure that the gasket is not worn or broken.

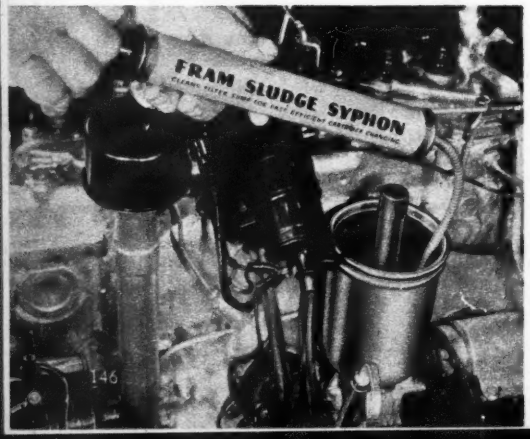
engine clean and at top efficiency.

Always sample the oil *after* it has been warmed up and after the normal amount of cold motor diluent has been driven out of the crankcase vents. A smell of gasoline in a warmed-up sample of oil may be a warning that the automatic choke isn't opening soon enough. It can also mean excessive blowby. But don't be like a friend of mine who forgot that if the crankcase vents are clogged, vapors won't have a chance to blow out and will condense to increase the oil's diluent content.

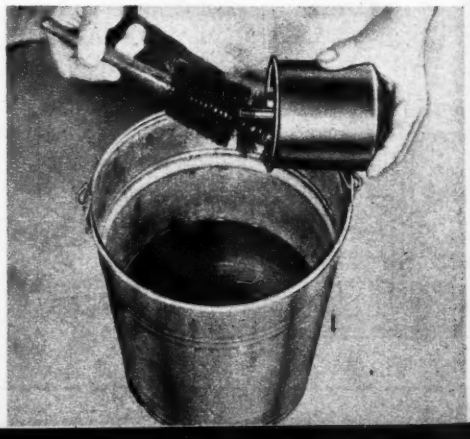
If the oil feels as if it has no body, or seems a bit gritty, it not only needs changing but also indicates that some other matters need looking into. Oil can be light and still have definite oiliness. It is what you should expect of detergent oil or regular oil with which you have combined an additive. Any feeling of solids in the oil is a sure sign of sludge, an emulsion of carbon, lead, water, acids and other chemicals. If the filter shell has a drain, by all means remember to open this up occasionally to remove what is trapped in the shell. For best results do this when the oil is hot.

Oil changes should always be made when the engine is hot. This way you get a complete draining with crankcase sludge oozing out as well. While it is true that modern oils are designed for longer mileage [*Continued on page* 159]

Syphon all the old oil and sludge from the filter housing before inserting new cartridge.



If complete filter housing can be removed, use brush and gasoline for cleaning.



Home Intercom Systems

[*Continued from page* 139]

coil leads plus and minus according to their battery connection. If it moves the other way, reverse your markings.

In making a series connection, wire the hot side of your output transformer to the plus terminal of the first speaker. Connect its negative side to the positive terminal of the next speaker and so on. The return to the transformer is made from the minus terminal of the final speaker in the series. This return lead is normally grounded. Switches and volume controls can be placed in the circuits to the individual speakers.

When it comes time to buy the components for your intercom system, be guided only by your communication needs. For instance, the fact that one unit is wired so that power is on only when someone is actually talking is not in itself a tremendous advantage. The amount of current drawn by an intercom is negligible. Nor is it worth it to pay extra for push-pull amplifiers in intercom systems. The speakers in these hook-ups negate the superior fidelity of the push-pull amplifier.

Use the same common sense you would in buying any electronic equipment. Ask for a demonstration of the intercom you're interested in buying. Listen for excessive hum, a high noise level, switching pops and general tone quality. If the unit has a built-in radio, try it on several different stations, checking for sensitivity and selectivity. Look the whole works over for evidence of poor workmanship or hasty assembly. Ask for a warranty of some sort. Don't hesitate to do a little comparison shopping.

If you think that you may want to add to your system in the future, be sure that the company that manufactures the units that you now buy also makes the ones you may want later on.

Installation

There are two ways to install your intercom system. In one, all the components are built flush into the walls or ceilings. All connecting wires are hidden between interior walls. It's an easy matter to build-in an intercom in a home that is not yet finished and for the sake of neatness and decor it may be desired. The built-in installation is also possible in an existing house but, of course, is a good deal more difficult—particularly when it comes to stringing wires.

If you don't want to bother with a built-in system, you can get components which you can perch atop desks, or on a book shelf, or suspended from the wall. This is the best way to get maximum flexibility from a limited number of components. You can work it like a plug-in phone system, plugging and unplugging master and remote stations to suit the occasion. Flexibility is a strong argument for the wireless units now available.

All manufacturers supply extensive instructions on how to install their components and how to wire them. There are a few points that all these systems have in common. One is to allow sufficient ventilation around any part of an intercom system that uses vacuum tubes. If such a component is built into a wall, be sure that you have removed enough inner wall insulation to give it room to "breathe." Another point is to allow plenty of slack wire when installing a built-in installation. Also, check the instruction for grounding the system and take care to wrap all splices with tape and be sure that all terminal connections are firm.

If you have any doubts about whether you have connected the system's individual parts together properly, or if the system doesn't work properly, don't hesitate to write to the manufacturer. He'll stand back of his product as it is to his best interest to make sure you are a satisfied customer.

Over and out. . . . •

ATOM-BOMB SHELTER

Combine practicality and security by engaging in this two-in-one project which includes a double garage and a sturdy concrete shelter built into one corner. Shelter may be used for storage or as tool room. For your copy of the complete plans which include diagrams and full instructions, remit $1.00 to *Mechanix Illustrated* Plans Service, Fawcett Building, Greenwich, Conn. Plan No. HJ-18.

PHOTOGRAPHY TODAY

The new Rolleiflex—it floats!

SPLASH—and it was with a good deal of trepidation that we made that splash on the opposite page. It was made by a new Rolleiflex camera tossed into a lake! In describing this camera, Mr. Rizatti of the Burleigh Brooks Company casually mentioned that it will float in its new case. "Try it and see," he told us when we borrowed the camera—so we did.

First we dunked it, gingerly holding on to the strap. It floated. Then we dropped it from a height of several feet into the water. It sank. We held our breath—and it popped up again. We opened the case with some misgiving and found that despite a few drops of water that somehow had gotten in, probably because of a faulty rubber gasket, the camera was safe and dry.

The big news on the new 1957 Rolleiflex camera is the built-in exposure meter. The meter can be pre-set for films from ASA 6 to 800. An automatic depth-of-field indicator coupled to the diaphragm shows the actual depth-of-field being covered at any particular lens opening. A locking arrangement couples the shutter to the diaphragm so that once the correct diaphragm and shutter sped combination have been determined by meter, changing to another shutter speed automatically sets the diaphragm to the proper value. The camera with an f-2.8 lens sells for $331.50, plus $18 extra for the leather case.

The metal ever-ready case which protects the camera from dust and water, and incidentally has a built-in dehumidifying cartridge, is available for $29.95. This metal case, called the Rolleiguard, has some unique features. In addition to its watertightness, it forms a platform for the camera as illustrated in the pictures on the left. It is a worthwhile accessory for photographers who spend much time in damp places and for folks who casually dump their cameras in back of cars—we suspect our own Tom McCahill of the latter sin. All in all, the camera is very finely machined and finished in true Rollei tradition with enough controls and accessories to delight any technician.—*R.B.*

1

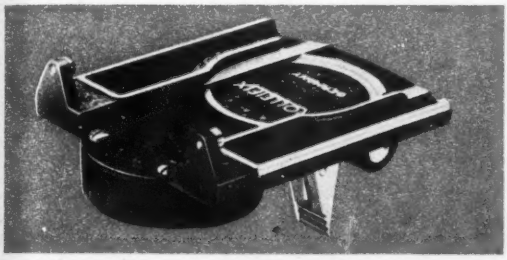
2

3

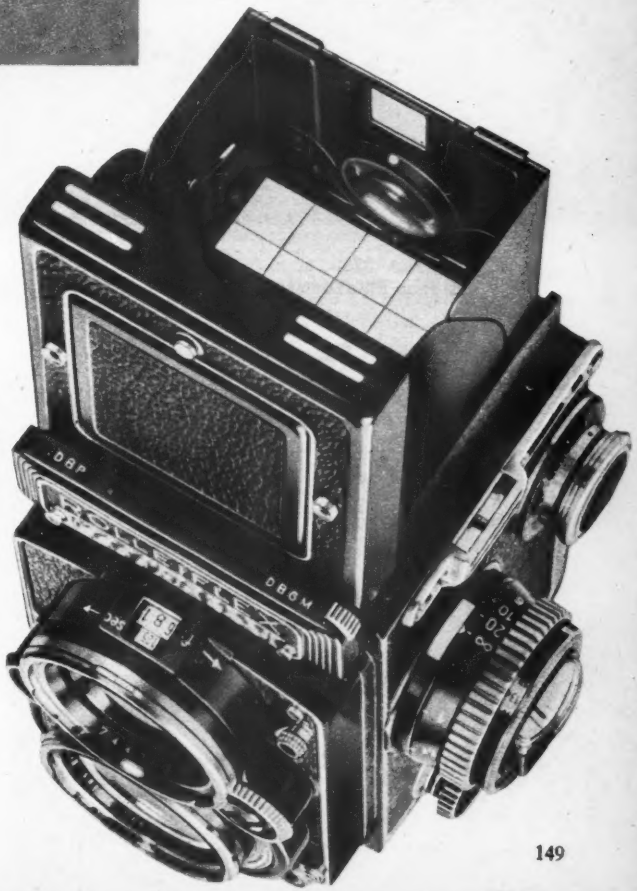
4

1. Cam-type handle breaks air seal on new metal carrying case. 2. Front half of case is then lowered. 3. Camera is swung upwards. 4. Camera then locks in picture-taking position on top of case.

Will the camera float in its new case? Yes, as this photo shows.



Rolleifix permits quick attachment and removal of camera from tripod. The lever at bottom locks this device to a grooved tripod base at bottom of camera. The Rolleifix is then left permanently installed on the camera tripod. Sells for $5.95.



New Rollei has built-in meter, automatic depth-of-field indicator and diaphragm locked in step to shutter speed. An honest face and $331.50 will procure it for you at your photo supply dealer.

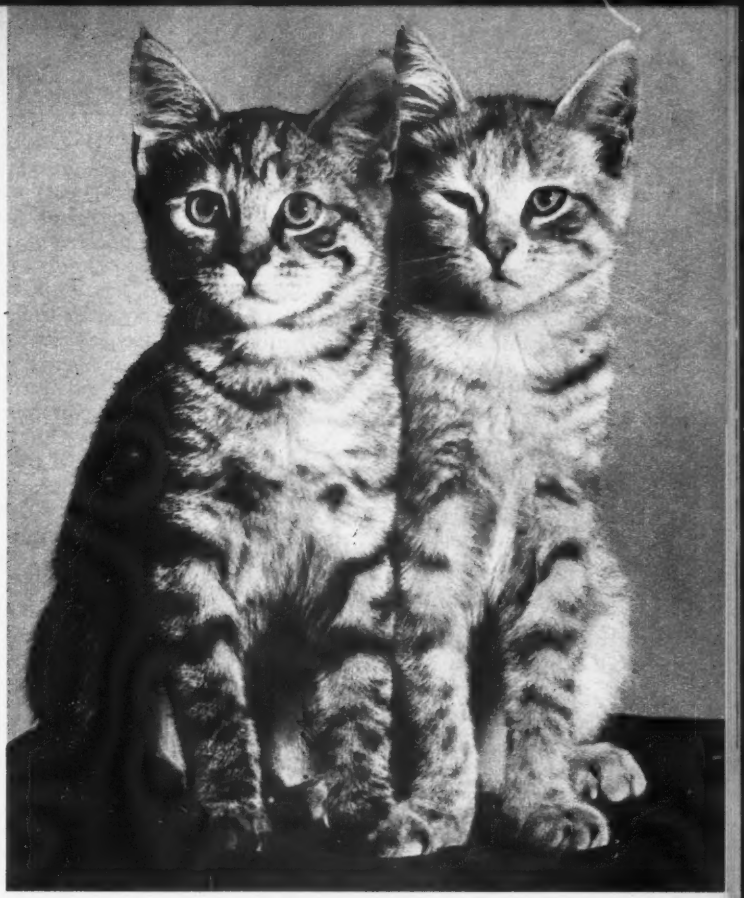
MONTHLY

PHOTO CONTEST

1st Prize ($25) .....The Fourth
By John Bulakowski of Trenton, N. J. Super XX film, f-11, time exposure.

Please put your name, address and picture-taking data on back of each print. Wrap with cardboard stiffeners and enclose a self-addressed stamped envelope of postage for return of unused photos. Prize-winning pictures are not returned. Judges are MI Editors. Duplicate prizes awarded in case of tie. Address entries to: *Mechanix Illustrated*, Photo Contest, 67 W. 44th St., N.Y.C. 36.

$10 Award .....Cheesecake
Raymond Pace of North Merrick, N. Y., used a 4x5 Graphic camera for this shot. Super XX film, 1/100th at f-32. One No. 5 flash bulb was used for a fill-in light.



$5 Award .....Mike and Ike
Strob light photo by Lucien Eloe of Neptune, N. J. Tri X film, 1/50th at f-16.

$5 Award .....“Wait Till 1960!”
Taken with a 35mm Canon camera and telephoto by C. T. Skrogstad of Sterling, Ill.

Plywood Tips For The Boatbuilder

[*Continued from page* 143]

water. Although it does not penetrate through the wood it does soften the outside surface, which is subject to tension when bent.

Ordinary acid swabs make fine brushes for spreading glue quickly and uniformly. Save paper cups from a coffee break or a picnic for mixing small lots of glue as needed. After installing any part of a boat, wipe excess glue off at once while it is wet; if allowed to dry it will be very hard to remove.

One reliable method of concealing screw heads in plywood is to drive the heads in just a little below the wood surface and fill them over with plastic wood. To insure good adhesion, buy a bottle of plastic wood thinner and, with a camel's hair brush, put a drop of it on each screw head before applying the plastic wood with a putty knife.

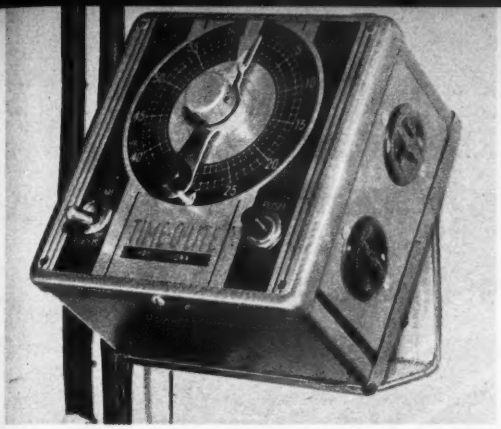
Fir plywood tends to develop surface checks when exposed to weather. Usually it is the decking, cabin tops and floorboards that check since such areas receive sun rays more directly than the sides of a hull. Leaving an unpainted plywood boat outdoors is bad and the best way to ruin a finished one is to turn it upside down and let it broil in the sun. Proper finishing will protect a boat from checking for a long time, and even checked wood can be fixed up fine with a good sanding, re-priming and painting. Better boats have decks, roofs, etc., covered with canvas, Fiberglas or Celastic for protection. Celastic is a plastic-impregnated fabric which looks like blotting paper. Dipped into a solvent it goes limp and can be spread and rubbed onto wood easily, the plastic impregnation being the only adhesive needed. It cures in a few days, is extremely hard and clings to wood and metal wonderfully. It is also wonderful for protecting plywood edges from chafing, for worm-proofing bottoms and making repairs. H. A. Calahan, Inc., 859 Mamaroneck Ave., Mamaroneck, N. Y., handles it.

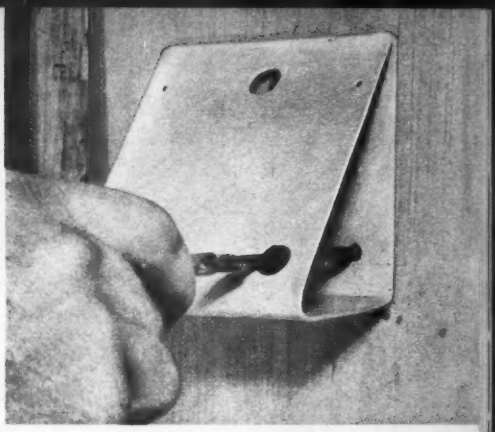
A good paint job is based on the use of sealer formulated especially for the job. It prevents checking and grain raising better than anything else. Firzite is one popular brand and most marine paint makers put out equivalent products. Never, never sandpaper fir plywood before putting sealer on. Doing so will ruin the paint job. Get a scrap of fir plywood and run your sander over it; it will then be rougher than it was before sanding because the sandpaper tends to slide over the dense, darker portions of the wavy grain and scuff out the softer, light-colored portions. Sealer locks the softer fibers so the sandpaper cuts them off evenly with the harder areas.

A good painting scheme is to first brush on sealer. Allow it to dry until it sands without gumming. Sand lightly to take off excess plastic wood over screws and any noticeably rough spots, but don't do any more than skim the fuzz off the bulk of the surface. Brush on a coat of marine undercoater. When dry and hard, sand thoroughly to cut down brush marks and rough areas. Put on a second coat and sand down again but try not to go through to wood. If desired, thin some undercoater with turpentine so it will go on without brush marks and put on third coat. Sand with finest paper and then finish off with two coats of marine enamel. Strain the paint through an old silk stocking, use a new, clean brush about 2 or 3 in. wide and brush out each coat well to avoid sagging.

The trick to getting a good varnish job on mahogany trim is to first go over the wood with paste wood filler. This stains the wood a uniform rich color and fills pores. Cover with a clear marine sealer before varnishing because varnish sometimes makes the paste wood filler bleed. Sand with fine paper and put on two or three coats of varnish with a new, clean brush. Buff the second coat with fine steel wool (but be sure to vacuum out all wool bits or they will cause rust spots). The third coat will be like glass.

And here's a final tip. Treat your boat with a good auto body wax to protect its finish against rain-streaking, grime and discoloration. In salt water areas this is especially helpful. It is also a good idea to wax a new outboard motor to protect its finish from corrosion. •





Mounted on the wall below the safelight, your electric timer will be easy to see in the darkroom. Use angular metal bracket so rays of safelight strike timer directly. Bracket is mounted with wood screws and sheet metal screws are used to fasten timer to bracket.

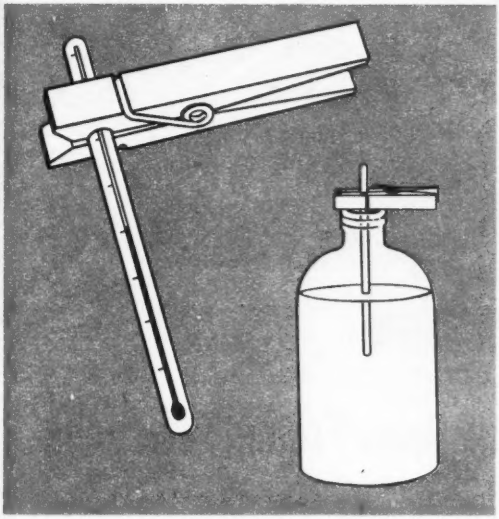
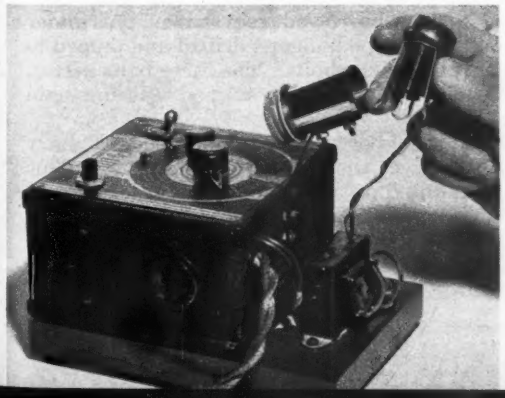
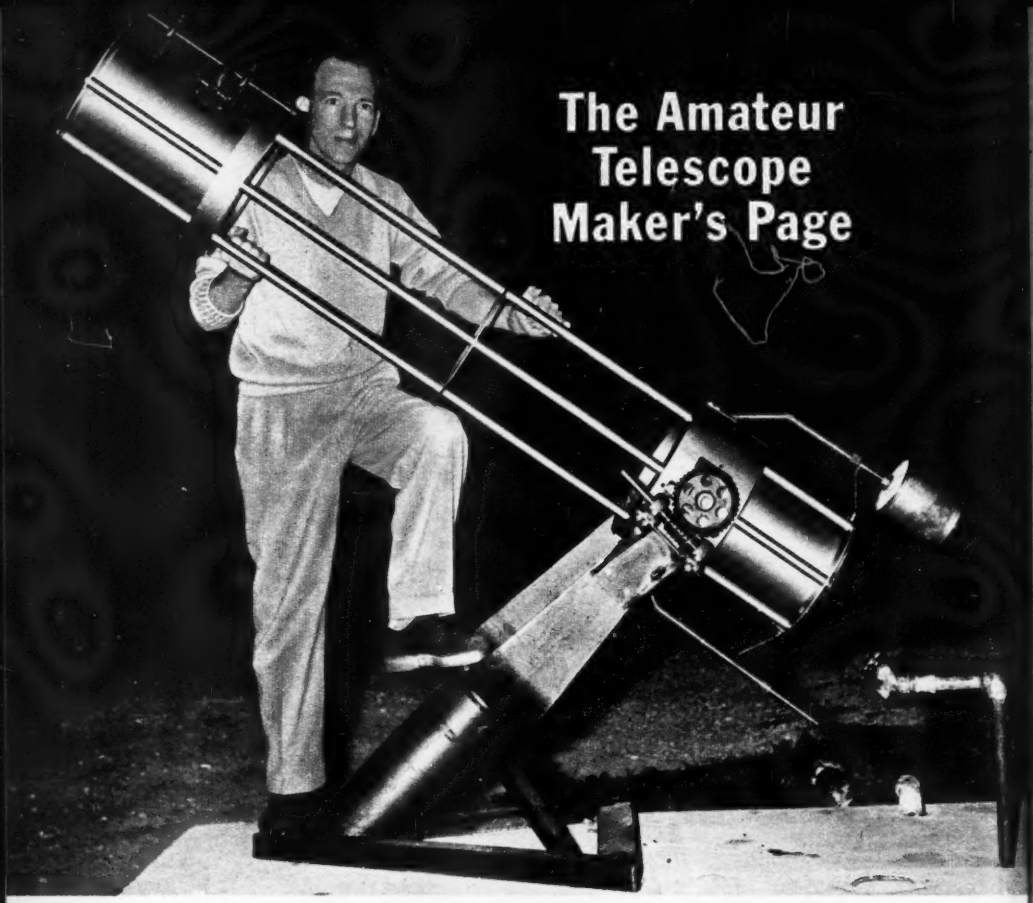


PHOTO TIPS

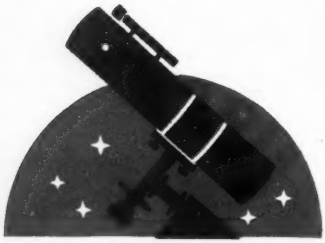
When taking temperature of solution in deep bottle, use a clothespin to keep thermometer from slipping down.

Another means of illuminating timer is by means of a 6.3-volt lamp installed in aluminum tubing. Lamp is wired through filament transformer to timer's power cord. Cap on tubing has circular cutout and light is shielded by three layers of red cellophane.





The Amateur Telescope Maker's Page



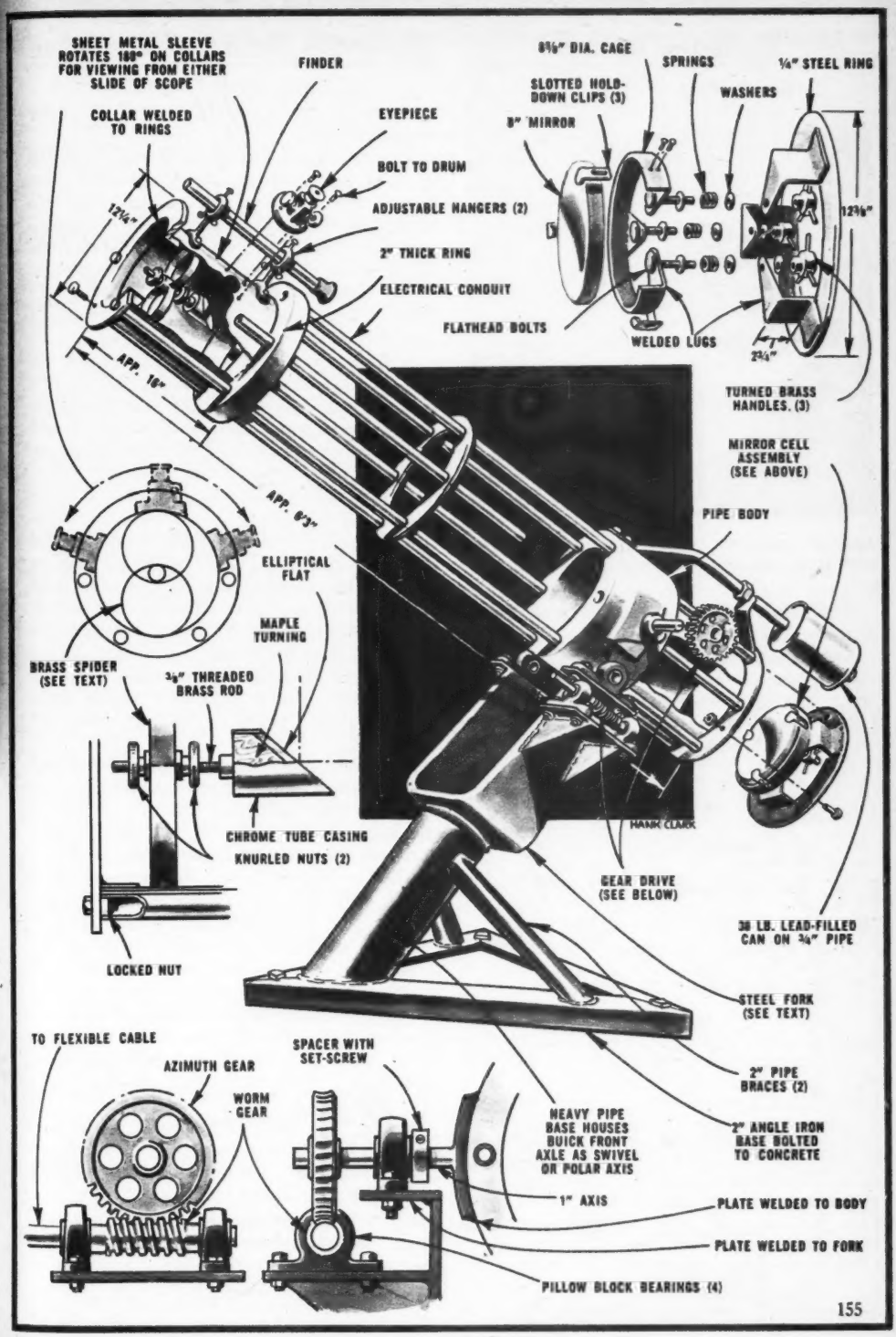
Electrical conduit forms the framework of this eight-inch reflecting telescope.

An Open Frame Telescope

THIS telescope uses an eight-inch, f-8 mirror, ground by hand. As can be seen it is of open frame construction. This type was chosen to eliminate bothersome convection currents.

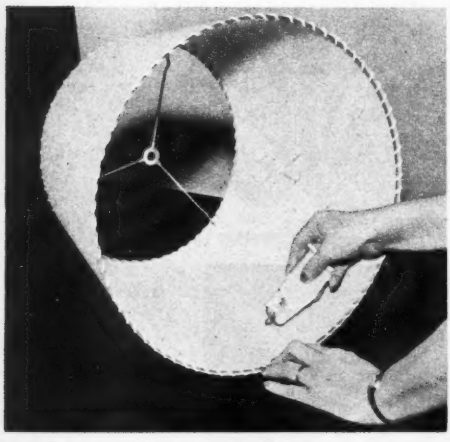
The unusual front end was designed to allow the eyepiece to be rotated 180°. The finder consists of a 'scope borrowed from a rifle. This finder is mounted in pipe hangers, drilled and tapped to take three machine bolts. The three bolts permit the finder to be accurately aligned with the main tube.

An elliptical flat is used instead of a customary prism to direct the rays to the observer. This flat is mounted on a piece of maple stock shaped to fit. The entire secondary mirror system is housed in a short piece of tubing. A three-inch, ⅜-in. diameter rod, threaded and inserted in the far end of the mirror [*Continued on page* 190]


SHEET METAL SLEEVE ROTATES 180° ON COLLARS FOR VIEWING FROM EITHER SLIDE OF SCOPE
FINDER
8⅝" DIA. CAGE
SPRINGS
¼" STEEL RING
SLOTTED HOLD-DOWN CLIPS (3)
WASHERS
COLLAR WELDED TO RINGS
EYEPIECE
8" MIRROR
BOLT TO DRUM
ADJUSTABLE HANGERS (2)
12¼"
12⅝"
2" THICK RING
ELECTRICAL CONDUIT
FLATHEAD BOLTS
WELDED LUGS
2¾"
APP. 18"
TURNED BRASS HANDLES. (3)
MIRROR CELL ASSEMBLY (SEE ABOVE)
APP. 6¾"
PIPE BODY
ELLIPTICAL FLAT
MAPLE TURNING
BRASS SPIDER (SEE TEXT)
⅜" THREADED BRASS ROD
CHROME TUBE CASING
KNURLED NUTS (2)
HANK CLARK
GEAR DRIVE (SEE BELOW)
36 LB. LEAD-FILLED CAN ON ¾" PIPE
LOCKED NUT
STEEL FORK (SEE TEXT)
TO FLEXIBLE CABLE
SPACER WITH SET-SCREW
AZIMUTH GEAR
2" PIPE BRACES (2)
WORM GEAR
HEAVY PIPE BASE HOUSES BUICK FRONT AXLE AS SWIVEL OR POLAR AXIS
2" ANGLE IRON BASE BOLTED TO CONCRETE
1" AXIS
PLATE WELDED TO BODY
PLATE WELDED TO FORK
PILLOW BLOCK BEARINGS (4)

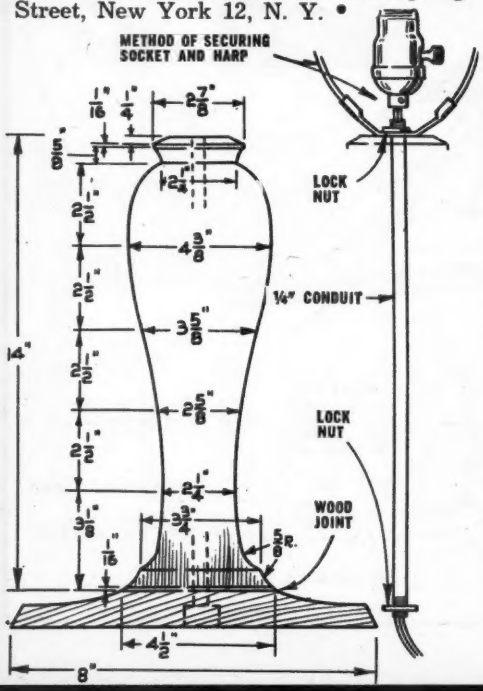
Custom Lamp

[*Continued from page* 115]



After all lacing is completed cover the seams with Duco cement and weigh down until dry.

The seam should be joined with Duco cement and weighted until set. The ends of the lacing are secured with a knot plus a drop of cement. The Polyplastex lamp shade material (which is made in many patterns and tints) and lacing are available from the Kerber Co. of 151 Spring Street, New York 12, N. Y. •



How To Build A Garage

[*Continued from page* 129]

conform to recommendations of the door manufacturer.

Use sheathing boards as diagonal braces to hold the walls firmly fixed after you plumb them into perfect alignment. To keep the walls from going out of plumb when the roof is put on, place braces from sidewall to sidewall across the garage. Cross the braces to form an X and nail them where they meet; three pairs of braces will do the trick.

Rafters are placed on 16-in. centers on the outside of stud positions. At every third rafter, attach a 2x4 collar beam directly over the studs. Collar beams should extend over the outside edge of the plate, equal to the distance the roof will overhang the side walls. In this case it's the width of a 2x4.

Mark and cut the 38 rafters needed for the roof. Provide a ridge board by tacking two lengths of sheathing to the side wall and marking stud positions on it. Rafters will be nailed to the outside of these positions. A plumb-cut rafter end is nailed to each end of the ridge board section. Where ridge boards meet at middle of the roof, attach a 14-in. "scab" as reinforcement for the joint.

After intermediate rafters are placed and nailed, tongue-and-groove sheathing is applied to the walls and the roof. Allow sheathing boards to extend beyond the ends of the side walls as support for a scaffold. The roof over the breezeway is a miniature version of the roof over the garage and is erected in the same way.

A 2x4 nailed to the upper edge of the front and rear rafters provides for the overhang.

Joints where roofs intersect should be covered with copper or aluminum flashing; cover the roof with felt before application of shingles. Follow roofing manufacturer's instructions for details.

Apply trim and exterior finish to the garage to conform to your house. Window and garage door installation varies according to the type selected. Here, again, follow recommendations of the manufacturer. Frequently, the door manufacturer installs his product as part of the deal, employing factory-trained experts. •

Golden Hammer Awards

[*Continued from page* 133]

Calif. . . . W. T. Bess, Huntington, W. Va. . . . Vernon Arndt, Everett, Wis. . . . William L. Stockbridge, Jr., Saugus, Mass. . . . W. H. Kitto, Salisbury, S. Rhodesia . . . Willur Schnetzer, Vally'o, Calif. . . . Fred Midgley, Westfield, Mass. . . . Frank Hoehn, Woodriver, Ill.

The following craftsmen have been awarded CERTIFICATES OF MERIT for their projects:

Stephen Cheselka, Elmhurst, N. Y. . . . William H. Vaught, Merriam, Kan. . . . Edward Gilbertson, Hillsboro, N. D. . . . G. Hollingsworth, Scunthorpe, Lancs, England . . . E. F. Vollrath, Ceylon, Minn. . . . B. M. Aikins, Seattle, Wash. . . . Ernest C. Nass, Flushing, Mich. . . . Douglas Owen, Castonia, N. C. . . . Lloyd H. Balch, Lansing, Mich. . . . Richard Buchholz, Toledo, Ohio . . . John Mercier, West Warwick, R. I. . . . Roy J. Scott, Tucker, Ga. . . . Wellington Grauhean, Blanchard, Idaho . . . Bob Mautner, Malibu, Calif. . . . Walter R. Wagner, Home, Pa. . . . H. W. Hair, Jr., Augusta, Ga. . . . Robert E. Tanner, Cheraw, S. C. . . . W. D. Young, Jonesboro, Ark. . . . K. E. Woodard, Jr., Miamisburg, Ohio . . . Vivian Arnold, Providence, R. I. . . . Henry Lowatsch, Flushing, N. Y. . . . Morris L. Littell, Colorado Springs, Colo. . . . Robert Cervenka, Waucoma, Iowa . . . Don R. Bradley, Galesburg, Ill. . . . William Canning, Totowa Boro, N. J. . . . Ralph Parsons, Edmonton, Alberta, Canada . . . James A. Small, Toronto, Canada . . . Willima M. Couch, Macomb, Ill. . . . Harry Mochamer, Summit Hill, Ga. . . . John Sinnott, Toronto, Canada . . . Ed Johanson, Belmont, Calif. . . . Robert P. Steffen, Fredonia, Wis. . . . Harold Wagner, Bridgeville, Pa. . . . Louis C. Zwieback, Palm Springs, Calif. . . . Owen R. MacDonald, Waltham, Mass. . . . Ray Radnis, Justice, Ill. . . . Sydney H. Watts, East Point, Ga. . . . James A. Tournoux, Massillon, Ohio . . . Leif Kallijornsen, Trondheim, Norway . . . Lohnas Van Wagner, Raiford, Fla. . . . Joseph F. Perkins, West Roxbury, Mass. . . . Michael M. Dorcy, Omaha, Neb. . . . Glenn M. Reddick, Albuquerque, N. M. . . . Robert Schenk, Republic, Mich. . . . Joseph Bonczek, Syracuse, N. Y. . . . John Lesko, Clifton, N. J. . . . Joseph McNamara, Chicago, Ill. . . . Joe Stanke, Stevens Point, Wis. . . . John Kerber, Lakewood, N. J. . . . Bill Baumlach, San Fernando, Calif. . . . Simon P. McGean, Nova Scotia, Canada . . . Emma Messina, East Boston, Mass.

Watch for the names of more winners next month. •

ATTENTION CRAFTSMEN!

Starting with next month's issue the number of runner-up prizes will be doubled; 50 instead of 25 GOLDEN HAMMER TIE BARS will be awarded.

Book Notes

CONCRETE AND MASONRY by Emanuele Stieri; published by Barnes & Noble Inc., New York, N. Y.; 227 pages; price $1.75.

THIS is another in the publisher's inexpensively priced Everyday Handbook series, especially designed for the student or layman who wishes to learn a subject quickly and painlessly. It thoroughly deals with every type of concrete and masonry installation, is profusely illustrated and includes many tables of various mixes, sizes, etc., etc. Excellent step-by-step instructions on repair and painting plus examples of many projects such as driveways, walks, walls and fireplaces should make this book an important part of every handyman's library.—*F.H.*

THE BOOK OF SONGBIRDS by Leon A. Hausman; published by Grosset and Dunlap, 1107 Broadway, New York 10, N. Y. 40 pages, $1.95.

A 78 rpm record of 24 bird songs comes with this one; listening to it may start your youngster on a career of bird watching. Text and drawings cover 84 American birds informally, with just enough nicely balanced bird lore. Who wouldn't like to know that a certain bird cries "I want to see Miss Beecher?" Too bad the record doesn't follow the text; it must be taken separately. Still, book and record are a good buy. Ned Smith's drawings (20 of them are color plates) capture bird charm as well as characteristic markings.—*H.G.*

SMALL BOAT MECHANICS HANDBOOK by Elbert Robberson; published by D. Van Nostrand, Princeton, N. J.; 254 pages; price, $5.00.

BOAT owners who read this book and then stow it aboard won't tinker with balky inboard or outboard engines, hoping that they'll do the right thing—they'll *know* what to do. In language that anyone can understand, and with helpful illustrations, Mr. Robberson teaches how and why an engine works and then, as if that wasn't enough, tells how to locate trouble sources and make emergency repairs. Not only gasoline and diesel engines are covered, but every electrical, mechanical and electronic device that's likely to be aboard.—*J.S.*

Have Fun With A Lie Detector

[*Continued from page* 122]

First drill the ⅜-in. hole for the control and the ¼-in. hole for the jack. Then, use the template provided with the meter as a guide for drilling its mounting holes.

Cut the circuit board to size and drill or ream the two holes to mount it on the meter. Flea clips are used to hold the transistor, but a socket (Lafayette No. MS-275) can be substituted. Attach the two battery holders and the resistors to the board. If desired, you may tie the batteries to the board and solder the wires directly to the terminals on the batteries. Follow the schematic carefully when wiring the unit. Make the leads from the board long enough to reach to the jack and the control. Once the meter is in the case, the other parts can be mounted in their proper places using the photo as a guide. Attach the switch to the control and wire it into the circuit. Wire up the rest of the circuit following the schematic carefully. Insert the batteries into the holders and the transistor into its flea clips. Check carefully to see that the polarity of the transistor and the batteries are correct; a reversed polarity can damage either the transistor or the meter.

To adapt the clips for our purpose, take the two Mueller No. 88 clips and remove the setscrews; twist the clip until it springs open. Now, replace the screws and wire the two clips to the plug with flexible wire.

Insert the jack into the plug but do not turn the unit on. Check once again for correct polarity of the batteries and the transistor and make sure that the control is wired correctly as shown in the photos. Turn on the unit, holding the two clips together. The meter should stay at zero. If it does not, check the circuit against the schematic. Now, connect the clips to one finger on each hand. Turn the control until the needle on the meter rests at about mid-scale. The needle should drift as your body resistance changes slightly. If the unit passes all these tests, you are ready to try it out on a subject.

Connect the clips as before and balance the meter to mid-scale. Do not turn the unit on unless there is some form of resistance between the two clips.

To use the meter properly, the subject must be asked a series of questions. It might sound something like this: "What is your name? Where do you live? Do you drink? Smoke? What did you do Saturday night?" etc., etc. Somewhere in this string of questions the subject should be asked something to which he is particularly sensitive. It may take a short time for the meter to give an indication but you will soon learn just what can be expected of the unit.

This detector makes an excellent demonstration unit for a psychology or law school class. But whether it is used for serious applications or just for some fun at your next party, it is a rewarding project for both builder and user. •

PARTS LIST

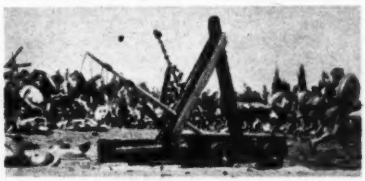
Electrical

Quantity
2 Resistors, 220 kilohm, ½ watt
1 Potentiometer, 1 meg; Mallory No. U-54 Midgetrol
1 Potentiometer switch, d.p.s.t.; Mallory No. US-27
1 Transistor, 2N138; Raytheon
1 Battery, 22½-volt; Burgess No. U-15
1 Battery, 15 volt; Burgess No. U-10
1 Meter, 0-500 microamperes; Triplett No. 327-T
1 Jack; Switchcraft No. 42A
1 Plug; Switchcraft No. 750
2 Clips; Mueller No. 88

Mechanical

1 Meter case; ICA No. 3996
1 Circuit board; Lafayette No. MS-305
1 22½ volt battery holder; Lafayette No. MS-177
1 15-volt battery holder; Lafayette No. MS-225
1 Knob; Lafayette No. KN-14
1 pkg. Flea clips; Lafayette No. MS-263
1 Lead wire, No. 24, stranded
4 Screws, No. 4-40x¼"
4 Nuts, No. 4-40

Ancient War Machines



The Scorpion, shown above, is just one of the Ancient War Machine models you can build from M1 plans. On the same full-scale plan, drawings for the Tower, Catapult, Ballista and Springal also appear, to give you a complete set. Send 50 cents to MECHANIX ILLUSTRATED Plans Service, Fawcett Bldg., Greenwich, Conn. Specify Plan M-238, War Machines.

Need An Oil Filter?

[*Continued from page* 146]

and filters keep them cleaner, the process of draining is still the best way to get rid of diluent. If a car is forced into too much short-run operation in cold weather, the crankcase will load up with diluent. The only safe recourse then is an oil change. A refilling every 500 miles or even less is sensible for some cars in cold weather.

Flushing oils or kerosene are not necessary. In fact, their use may be an invitation to trouble because some of it may remain in the system to dilute the new oil. If you are obliged to use an additive to check a sticky valve here's how to go about it:

First try driving the car on the open road for 25 miles or so. Often this is enough to free a troublesome valve. If this fails, drain off the oil, remove and discard the filter element, put the cover carefully on the filter again, fill the crankcase with the required number of quarts of regular oil (No. 20 grade in summer; No. 10 in winter) and then add a can of your favorite additive or tune-up oil. Next give the car a real work-out of about 100 miles or so. Then drain the hot oil, put in a new filter element and refill the crankcase with a detergent oil.

Just a word about removing that filter cartridge. Make certain, for instance, that you remove *all* the sludge in the filter shell before putting in a new element. Mechanics now use a sludge suction gun for this job. The shell should then be carefully wiped out. I say "carefully" because you do not want to leave any rag lint behind. After installing the element make sure the gasket is new and accurately positioned, otherwise there may be leakage after the cover is replaced. Mechanics always allow the engine to run a few minutes (car outdoors) to observe the filter gasket and to make sure it is tight.

Not many car owners realize that the oil system is further protected by an internal filter. This consists of a screen or strainer at the oil pump intake. Often this intake floats on the oil surface (if it is working properly), thus picking up the cleanest oil and avoiding the diluent which tends to

[*Continued on page* 168]

Aeronautical Engineer

[*Continued from page* 80]

There are about ten major kinds of aeronautical engineers. Let's describe some of the more important:

The aeronautical engineer can specialize in design. The sleek craft that zooms through the skies starts as an idea on the drafting board of the design engineer who creates the structural details.

He can specialize in aerodynamics, the forces that arise when the plane is flying through the air. This is the chap who has to worry about such things as lift, speed, climb, drag, range and stability of the aircraft.

He can specialize in flight-testing. After the plane is designed and built, this fellow sees to it that it works in the air. His job is to supervise the performance testing of a ship or its parts under actual flying conditions. He creates special testing equipment, supervises the test pilots, develops special laboratory tests and suggests alterations in design to improve airplanes.

There are other specialists: the tool design engineer who dreams up the machine tools to make the plane parts; the production engineer who works up the manufacturing process and is in charge of it; the operations engineer, responsible for the smooth running and maintenance of the ships in the great transport fleets; the sales engineers who market the planes.

How do you get to be one of these engineers?

While still in high school, take plenty of algebra, plane geometry, solid geometry and science courses. Then go on to one of many dozens of fine engineering schools or colleges scattered all over the United States. That's a four-year course leading to an engineering degree.

How can we get data on these schools?

Write to the National Society of Professional Engineers, 1121 Fifteenth St., N. W., Washington 5, D. C., and ask for the booklet on engineering schools. Valuable information is also contained in a booklet called Aeronautical Engineering As A Career published by the Institute for Research in Chicago. It's available in libraries. A pamphlet called Should Your Child Be An Aeronautical Engineer? by

[*Continued on page* 161]

Let's Claim The Moon—Now!

[*Continued from page 72*]

matic tradition, has set the ball rolling by recognizing the existence of the legal space question. To acquaint himself with the strange new problem, he appointed one of his top aides, Hermann Phleger, to the task of studying all legal problems of sovereignty likely to arise in the immediate future on the matter of international rights in upper space. This field is so new and so complicated that before long Mr. Dulles may have to face the question of creating a special section in the State Department assigned to dealing only with matters of space rights and sovereign principles in the heavens.

In international law, the accepted principle has been that a seaboard nation's sovereignty extends three miles out to sea. A conference of American nations held last April in the Dominican Republic discussed the question whether this limit can be extended to 200 miles out. So then, can the three-mile or 200-mile sovereignty rule be applied vertically to the skies? Can freedom of the seas be applied to the upper stratas of the atmosphere—freedom of the air? The urgency of answers to these questions daily becomes more apparent.

One cause behind this urgency, of course, is the race between Russia and the U. S. to get their unmanned satellites into the sky. The Russians have been exceptionally vociferous in their claim that they will beat us with bigger and better satellites. Whether such devices, rotating on fixed paths, can escape international incidents remains to be seen. Each time a man-made object circles the earth, it technically violates the sovereignty of countries below. Much depends on whether the question of how high is up can be solved amicably, or whether the Russians, for instance, will obstruct us with accusations of military peeping.

The most disturbing element in this whole situation is that the Russians are talking in positive terms of hopping off into space very soon. They don't care whether we believe it or not, or call it propaganda. The U. S. experts, on the other hand, keep stressing the cost of any major heavenly exploration and give the impression that three to five decades must pass before space-hopping to the Moon or any of the planets can start.

The latest statement from the American side comes from John J. Crowley, director of the Pentagon's guided missiles development project. He insists that a manned earth satellite equipped to accommodate 80 scientists and traveling 18,000 mph in the sky, must first be put into operation at an altitude of 1,000 miles. Crowley stated:

"Such a space satellite could be a reality in 10 to 15 years. In the next 10 years thereafter planes and ships could be perfected so as to make the trip to the Moon and return. Once on the Moon, the adventure really begins. The Moon becomes our space satellite from which we can launch ourselves into outer space to explore Venus at its closest approach 26,000-000 miles away."

Most American rocket experts and science engineers estimate 30 years before we reach the Moon. And in practically every calculation the staggering cost of building lunar rockets is cited as the obstacle.

The latest statement from the Russian side is glimpsed in an article in the Soviet Weekly written by Y. Khlebtsevich, chairman of the Scientific-Technical Committee for the Moscow Astronautics Section. In his opening paragraph, he states:

"Flights in interplanetary space and to the Moon, it appears to us, can be realized within the next five to ten years. The real possibility of such flights is based on a firm scientific foundation."

Khlebtsevich then concludes with the following:

"No longer are there any difficulties of principle in the mastering of the Earth's nearest satellite with the help of radio-controlled rockets and tank-laboratories. This is why it is possible to conquer the Moon within the next five to ten years."

From the foregoing, and similar intelligence out of the Soviet Union, the risk of America losing the race into space and therewith the honor of first reaching the Moon seems to be very great. So why don't we start *now* by making a giant effort to plant the U. S. flag on the Moon through a series of rocket shots. •

Aeronautical Engineer

[*Continued from page* 159]

Igor Sikorsky is available free from the New York Life Insurance Company, 51 Madison Ave., New York 10, N. Y.

Can we talk a bit about aviation technicians, the fellows who work in and around planes but who aren't engineers? Is there also a demand for them?

An unprecedented demand. In fact, all authorities are pretty much agreed that there is now a critical shortage of all types of technical personnel in the country, and especially in the aviation industry.

You don't need an engineering degree to be an aviation technician?

No, even though it's a highly skilled job.

Is the pay good?

Darned good. And there are wonderful opportunities for advancement. Starting pay ranges from $300 a month and up, and supervisory jobs are open to fellows who show ability.

What about working conditions for technicians?

Ideal. Most of the plants, hangars and labs are new, since this is a new industry.

What is the best way to prepare for a job as aviation technician?

Attend a good residence or correspondence school. Remember that anyone who works on a civil aircraft needs a license issued by the Civil Aeronautics Board. This license is granted after an examination. On choice of a school, the best suggestion is to talk with your high school guidance teacher, or write to the National Council of Technical Schools, 912 Seventeenth St., N. W., Washington 6, D. C.

Any other word to the young fellow who may be thinking of a career in this field?

Just one final thought. At the time he was president of MIT, the late Dr. Karl T. Compton made the following statement based on a survey of some 500 corporations in all parts of the country:

"An engineer," he declared, "is 12 times more likely to become president of his company than a non-engineer, five times more likely to become treasurer and 30 times more likely to become an officer of his company."

Does this hold true for an aeronautical engineer as well?

Sure. There's no place to go but up! •

The '57 Lincoln

[*Continued from page* 87]

The long, uninterrupted hoodline could easily serve as a picnic table for the Notre Dame football squad and the four-pronged star from the '56 Continental has been respoked and now appears not only on the hubs but on the tail, front fenders and hood. The rear fender line, which starts just aft of amidships, produces a lowering illusion, as do the flattened-out front fenders. Anyway you slice it, this car is not quite as conservative in appearance as it was in '56 but the added garnishes do not detract from the overall dignity any more than a good custom-made striped shirt detracts from an expensive blue suit.

As Ford's Engineering Division can rustle up more men on its proving grounds on 20 minutes' notice than Nasser could produce last November for the Canal Aquatic Sports, I wasn't too surprised to find out that some of these boys had had their heads under the hood during the long summer months. The '57 Lincoln sports a new Carter carburetor, which is smooth but unexciting, and some other goodies which are too frivolous to note. For my little bag of dough this is a great automobile, conservative on the performance side but capable of becoming a wildcat with the addition of a few such things as a hot cam and a transmission that is less of a calorie-consumer. While doing this piece I had to pinch myself into realizing that Lincoln, once the hottest road car in America just a calendar page or two ago, is reaping a bigger harvest now by appealing to the man who would rather hear the sound, substantial thud of a Chase Manhattan Bank vault door than the strains of You Ain't Nuthin' But A Houn' Dog. •

You Think This Is Cold?

[*Continued from page* 103]

to the rule. Don't try it yourself.

The symptoms of freezing are fairly easy to spot. First there is lividness of skin, followed by a dead-white pallor as blood vessels constrict and blood is forced away from the skin. Then an intense sleepiness comes with torpor of the entire muscular system. (Funny thing, but these charac-

[*Continued on page* 164]

Everything you need to

PROCESS COLOR SLIDES

exposed on Kodak Ektachrome Film

Think of it—in *less than two hours* after you click the last shot on a roll of No. 135 Kodak Ektachrome Film, your full-color transparencies can be completely processed. And as soon as the film is dry, it takes only a few seconds to mount each sparkling frame for *immediate* viewing!

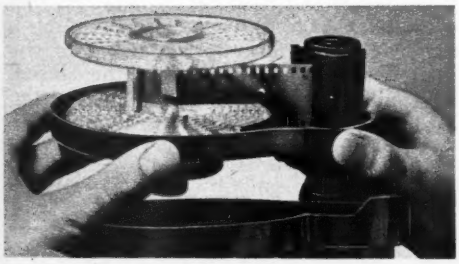
Everything you need—equipment, supplies, step-by-step instructions—are included in the new Kodak Ektachrome Processing Outfit, 35mm. Since you work in normal roomlight, you can process color slides anywhere—even on a vacation trip. The chemicals in the outfit will process six 20-exposure rolls of No. 135 Kodak Ektachrome Film (either Daylight Type or Type F). Complete replacement of these chemicals costs only $1.80.

NO DARKROOM REQUIRED

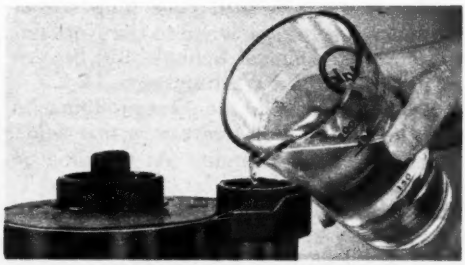
Ask your Kodak dealer to show you how easy it is to process Ektachrome transparencies. And don't forget . . . he also has Kodak Photo-Hobby Outfits for developing and printing black-and-white snapshots. These kits also contain *everything* needed—and are so easy to use your whole family will enjoy them. *Kodak Photo-Hobby Outfits,* from $9.95.

KODAK EKTACHROME PROCESSING OUTFIT, 35mm **$26.50**

These are the four basic steps in processing-



KODAK DAY-LOAD TANK simplifies transfer of exposed film from the film magazine to a transparent reel. Reel and magazine fit into separate tank compartments. With light-tight tank cover in place, loading the film onto the tank reel takes place by simply turning a knob. It's all done in normal roomlight!



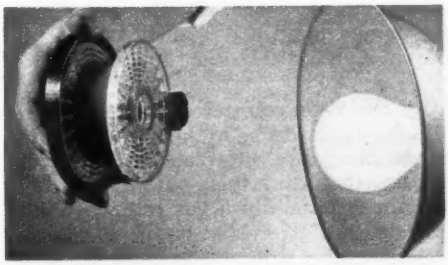
ONLY 6 CHEMICALS, interspersed with plain water baths, are needed to bring out the gorgeous colors in Kodak Ektachrome Film. Each chemical is stored in its own color-coded container. With the empty film cartridge removed, liquids are poured in and out of the developing tank in full roomlight as shown.

EASTMAN KODAK COMPANY,

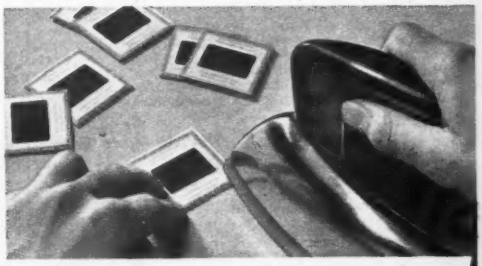
OUTFIT INCLUDES

- Kodak Day-Load Tank
- Kodak Ektachrome Processing Kit, Process E-2 (chemicals)
- Thermometer
- Stirring Paddle
- Plastic Film Clips
- 16-oz. Graduate
- 6 pint-size Color-Coded Containers
- 100 Kodak Ready-Mounts
- Two Trimming Guides
- 4 Kodaslide Storage Boxes
- Step-by-Step Instruction Card

mounting Ektachrome transparencies . . .



RE-EXPOSING the color film (to reverse the images from negative to positive) takes only 60 seconds. No need to touch the film with the fingers because light reaches all portions of it through slots in the tank reel. After re-exposure, film receives final processing baths.



FULLY DEVELOPED film is dried in the usual way. Individual frames are cut to size with trimming guides, then inserted in cardboard mounts provided. Edges of each mount are sealed with a warm iron.

Rochester 4, N. Y.

Prices include Federal Tax where applicable and are subject to change without notice.

Kodak
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FREE PLAN

Tells How to Start Your Own Business

FILING SAWS

Saws come from 20 and 30 miles

"I rented a two-car garage and have all the work I can do. Some days I start 6:30 in the morning. I get work 20 and 30 miles from my place of business." — Charles H. Smith.

Each Saw Filed Brings Six More

"Each saw I filed got me six more and business has been picking up that way since a year ago. If it keeps up I will have to buy another Foley Saw Filer." — William C. Baldwin.

FOLEY FILED SAWS BRING NEW CUSTOMERS

Here is a steady repeat CASH business that pays up to $3 to $5 an hour, and you can start in your own basement or garage in your spare time. Every saw you sharpen with the machine accuracy of the Foley Saw Filer is an ad that brings you more customers. S. M. Hollingshead wrote to us: "I am doing very well with my Foley Filer, and I am glad I invested in your machinery. It is very satisfactory and works very well in the small community in which I live."

You can file all hand saws, also band and cross-cut circular saws on the Foley Saw Filer. The adjustments are simple—there is no eyestrain—and you can start right away to turn out perfect cutting saws. "The first saw I sharpened with my Foley Filer came out 100%. I think it is a marvel of perfection."—writes Clarence E. Parsons.

FREE BOOK Shows How To Start In Spare Time

"MONEY MAKING FACTS" explains how you can get business from hardware stores, home owners, farmers, carpenters, schools, mills, factories, etc. Just think — with a modest investment, no overhead, no stock of goods to carry, you can start right in on a cash business that will help pay the rent, buy groceries, or a new car. Start now — send coupon today. No salesman will call.

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FOLEY MFG. CO., 215-7 Foley Bldg.
Minneapolis 18, Minn.

Send me free book "MONEY MAKING FACTS."

Name_____

Address_____

You Think This Is Cold?

[*Continued from page* 161]

teristics—pallor of skin and intense sleepiness—are present in most of us in this office.)

The popular misconception is that the proper way to treat frost-bitten or frozen extremities is to massage them with snow. Try this with a properly frozen foot, for instance, and you'll find yourself rolling around a handful of frozen toes like Birdseye peas. Yep, they'll snap right off. Never, but never, massage or rub frozen flesh. The idea is to warm frozen extremities slowly and gradually, either under covers or in tepid water.

Even if you were a Siberian *sapoi*-sipper and endured —100° weather every winter you still couldn't impress the lads who've been doing some mighty wild things in low temperature research labs lately.

According to these physicists, it isn't *really* cold until you get down around —459.6° F (—273.1° C) which is Absolute Zero. A nice, short definition of Absolute Zero is "the unattainable state of complete absence of heat." Absolute Zero is a theoretical standard of cold that will never be reached. But the test-tube boys have come close to it—within 1½ thousandths of a degree to be exact.

Down in these frigid depths scientists, not content with Fahrenheit or Centigrade systems of measuring temperature, use "degrees Kelvin." One degree Kelvin is about equal to —458° F. Degrees Kelvin are named for Sir William Thomson, 1st Baron Kelvin, a British scientist (1824-1907).

By the time you get down near Absolute Zero everything in the world is frozen harder than a pawnbroker's heart except helium, that stuff they put in dirigibles. Helium is normally a gas but when it is cooled to 4.2° Kelvin it becomes a liquid.

Supercooled helium is used to chill other materials down close to Absolute Zero. And why do they want to chill materials down close to Absolute Zero? This is where the going gets sticky, son, so stay close to Daddy.

Heat, according to the latest theories, is actually the violent agitation of molecules of matter. For instance, at 32° F molecules

[*Continued on page* 174]

New! For furniture, cabinets, built-ins—

Weldwood Old Craftsman Pine Plywood

the easiest working, easiest painting plywood ever!

American Hutch Cabinet. Photo from Fawcett Publications' "Furniture You Can Build."

Combining all of the advantages of pine lumber:

- Easy to work
- Cuts clean, sands smooth
- Easy to paint, stain, finish natural
- Paints more quickly
- Covers with less paint
- Less grain show-through

With all of the advantages of plywood construction:

- Large (up to 4′ x 10′) sizes for less joining and fitting
- Tremendous strength
- No splitting
- Greater stability
- Resists warping

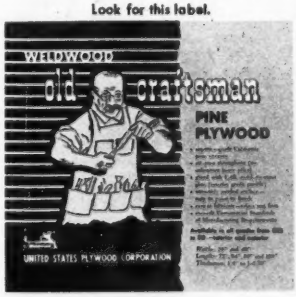
FOR many years, professionals have demanded pine plywood when they make built-ins, cabinets, toys and furniture. And now Weldwood has increased production so that Weldwood Old Craftsman Pine Plywood is available to everyone!

This is the finest pine plywood. It's all pine throughout, and made with an exclusive, mold-resistant bonding agent; available in interior and exterior grades. Old Craftsman Pine is carefully made, yet, it costs even less than cabinet-grade birch. Comes in sizes from 3′ x 6′ to 4′ x 10′; thicknesses from ¼″ to 1³⁄₁₆″. So, next time you start a project, do what the "pros" do—insist on genuine Weldwood Old Craftsman Pine Plywood.

Weldwood® Old Craftsman Pine Plywood

A product of **UNITED STATES PLYWOOD CORPORATION** *Weldwood—The Best Known Name in Plywood*

Look for this label.



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CITY.....STATE.....

How To Race Your Car At Daytona

[*Continued from page* 105]

car" in the Unlimited Class means the following: any car that is nationally advertised and available through any authorized dealer. Such a car qualifies for this class regardless of equipment—providing equipment is a regular production item.

So that there will be no misunderstanding, here are the following hard-bitten rules that all competitors must follow in Standard Production events. The cars must run with full equipment, all in operating order, at the start and at the finish. In other words, if the car should lose an exhaust pipe or a fan belt while making its runs, it will be automatically disqualified due to "equipment failure." There shall be no re-boring, porting, polishing or other alterations from original showroom condition except for tune-ups. Cars that have been altered may run in the Experimental Class *only*.

The deadline for all manufactured models was January 1, 1957, and any models announced after this date, regardless of production intentions, will not be eligible for the Unlimited Production Class. However, any late models showing up will be given a chance to show their wares in the Experimental Division. As in the past, the classes will be divided under the Unlimited standard group by cubic-inch displacement. These classes will be from 259-305 inches; 305-350, and above 350 cubic inches.

Only '57 model cars will be allowed to compete at Daytona. You can have someone else drive your car in competition if you desire. For entry blanks and information, write to NASCAR Headquarters, 42 So. Peninsula Dr., Daytona Beach, Fla.

Bear in mind that should you win an event or even place, your car will be completely torn down and inspected for any variations from standard which would cause immediate disqualification. My advice is to come on down to Daytona, have fun and compete and don't try any tricks—we know all of them—*Tom McCahill* •

TOM McCAHILL, Mechanix Illustrated Magazine

"An English-built Ford grooves the curves like a cannonball dropped thru a chimney"

SAYS TOM McCAHILL

Tom McCahill, world-famous automobile writer for MECHANIX ILLUSTRATED, reports on the Zephyr Mark II English-built Ford:

Distinctive styling . . ."good looking . . . excellent quality." **Powerful performance** . . . "The Zephyr bats out 0-60 mph in 17.2 secs. . . . Top speed 86 mph, means you can cruise any turnpike easily at top legal speed." **Easy handling.** ". . . its neat size is simpler for whipping through traffic and parking . . . the shift pattern is American . . . 3-speed gear box." **Roomy comfort** . . . "The back seat comfort is superior to many domestic cars . . . makes even a 6′ 4″ man comfortable on a long trek." *Demonstrate the right-model English Ford for your family today—11 models to choose from.*

A FORD PRODUCT

Sold and serviced in U. S. by selected dealers of Ford Motor Co., Dearborn, Mich.

At high speed the ZEPHYR MARK II takes a curve with ease and safety.

Whatever your business...

you save money with stapling

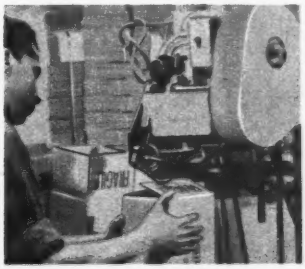
Below you see five of the vast number of businesses which report savings with Bostitch stapling. In shipping, Bostitch provides quick, easy carton closures—on seams, tops and bottoms—that actually strengthen the cartons. In production, everything from paper to sheet metal is fastened with Bostitch equipment—speeding output, cutting costs. A Bostitch Economy Man will be glad to help with your fastening problems. He's one of 375 trained fastening specialists working out of 123 cities in the U. S. and Canada. Over 800 different models of Bostitch staplers use 200 types of staples, tailored to the job.

These steel freezer cabinets, once spot-welded, are now wire stitched. *"Bostitch method trims fastening costs by 75%."*

Using Bostitch Autoclench stapler, this man says he seals boxes *"five times faster"* than he can with glue. Saving *"over 50%."*

Air freight bills stapled to corrugated containers with new-type tacker *"hold better than with tape at 1/10th the cost."*

Roofers use heavy-duty Bostitch stapling hammers to lay asphalt shingles on new roofs. *"Four times faster than nailing."*



"Twice as many boxes can be stapled in an hour, with only two-thirds as much manpower." Staplers take up less floor space.

For greatest savings, use only genuine Bostitch staples in Bostitch machines. They're precision-made to work together!

FIND HOW TO CUT COSTS in your business; attach this coupon to your business letterhead and mail today.

Fasten it better and faster with

BOSTITCH
STAPLERS AND STAPLES

Bostitch, Inc., 582 Mechanic Street, Westerly, R. I.

Name _____ *Position* _____

Company _____

Address _____

City _____ *Zone* _____ *State* _____

Does Your Car Really Need An Oil Filter?

[*Continued from page* 159]

settle at the bottom after the car has been standing. Where oil is fed to an overhead valve compartment there will also be another screen to help prevent foreign matter from getting to the valve gear and hydraulic valve lifters. This little screen may become completely clogged with sludge, gums and "varnish."

Whenever the engine's oil pan is taken down for manual removal of sludge, the oil pump intake screen should be cleaned. Clogging here has been known to burn out engine bearings by putting a pinch on the oil supply at a time when the engine is demanding all the oil that can be brought into circulation.

Just why is an oil filter desirable anyway? The fact that many engines have enjoyed long and trouble-free lives without filter protection is somewhat misleading because owners have failed to realize that filtration—no matter how efficient—will not compensate for use of inferior oils or failure to have the oil changed often enough. Fortunately we have proof that filters protect, for we have merely to examine the mess that is trapped in a typical filter element after only 3,000 miles of use.

By removing dirt and abrasives the filter saves wear on bearings and other engine parts which move against each other. Most owners buy engine overhauls because of excessive oil consumption. This is the real blow to the pocketbook which good filtration forestalls. If you are installing a new filter try to mount the filter on the engine rather than on the firewall so as to avoid flexing of oil lines.

Certainly there is no excuse for engineering which produces a filter accessible only when the car is hoisted on a lift. But that is where we find it on many a modern car. In such a spot the filter is hard to get at and the temptation to forget about it is natural. Filter covers do come loose from vibration. Gaskets do leak. Have your filter where you can watch it every time you lift the hood for inspection—which should be daily. Installing the oil filter near the exhaust manifold means a quicker warm-up for the engine oil.

There is a difference of opinion as to which type of filter is best—the by-pass or the full-flow. Filter makers usually make both types so you can choose either one. In the by-pass arrangement the filter is connected to the main lubricating system but does not take all the oil at any one time. A portion is continuously by-passed through the filter and back into the crankcase. In the full-flow type, all oil goes through the filter on its way to the bearings.

If the element of a by-pass system becomes loaded, the oil stops going through it. Until the owner has the element replaced, it is the same as operating the car with no filter at all. When the element of a full-flow system loads up, a special relief valve opens. This prevents the oil from going through the filter element. Here too, failure to replace the element is the equivalent of not having any filter at all.

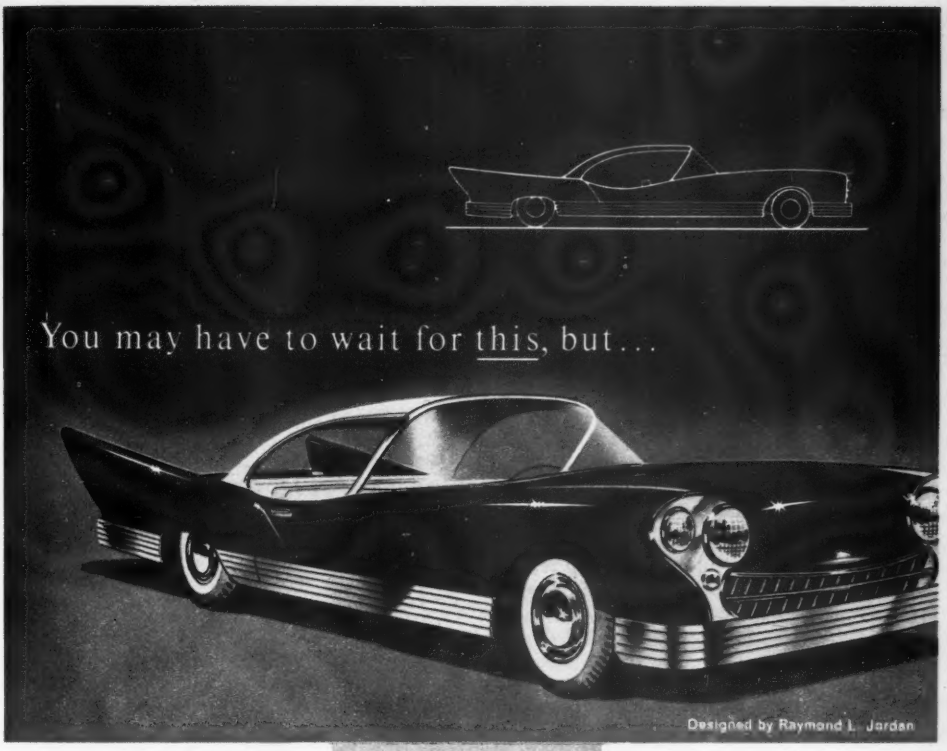
Various types of relief valves are used. They may be inside the filter shell or in its base. Some are made to open when oil pressure lowers to a point that varies for different makes and models of cars. The theory behind the full-flow filter is that while the element is functioning the bearings are always receiving filtered oil.

When we come to selection of an element we are likely to throw up our hands. So many types are available, so many sales arguments are used. There are waste-packed elements, cellulose disks and separators and some made of paper. Fuller's earth filters have been used in many cases.

Until 1955 Pontiac used a built-in sump oil filter which was actually a settling chamber concentric with the oil pump inlet tube. Oil would hit a baffle which changed its direction. Heavy particles dropped to the bottom. Many also recall the knife-type Cuno filter which you cleaned by turning a handle on the shell.

Checking your oil is more than a matter of taking a quick look at the dipstick. In today's high pressure motoring it is really a big story but always with the emphasis suggested by three little words—Keep It Clean. •

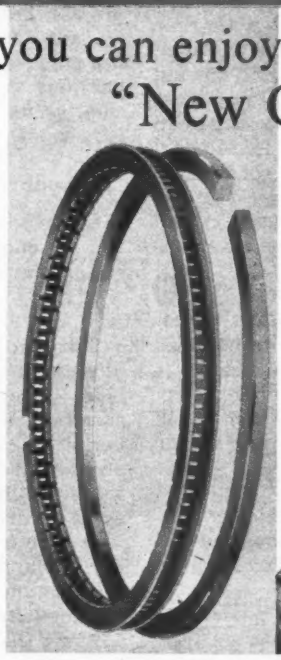
When answering advertisements please mention
MECHANIX ILLUSTRATED



right now you can enjoy that "New Car Feel"

While you're waiting for your "dream car" there's no need to put up with sluggish performance in the car you're now driving. Your Doctor of Motors—your skilled mechanic—knows how to restore the responsive power of your car's engine and to bring back that satisfying "New Car Feel."

Your Doctor of Motors also knows that there is no better way to restore full-power performance with positive oil control than to install Perfect Circle 2-in-1 Chrome piston rings. Perfect Circles are plated with thick, solid chrome that resists wear, more than doubles the life of cylinders, pistons and rings. See your Doctor of Motors for an engine check-up today! Perfect Circle Corporation, Hagerstown, Ind., The Perfect Circle Co., Don Mills, Ontario.



Install

PERFECT CIRCLE

2-in-1

Chrome Piston Rings

You'll be surprised how quickly and economically your Doctor of Motors can bring back the "New Car Feel" to your car!

MAIL FOR McCAHILL

Uncle Tom is sorry he can't answer all his mail personally. In this column he'll answer the most interesting letters. Write to him at MECHANIX ILLUSTRATED, 67 West 44 St., New York 36, N. Y.

● *Recently, during the first cold snap, the battery of my 1956 model car didn't have enough juice to turn the engine over. A friend with a chainstore tow cable offered to tow me so that I could get started. I got started all right but found the bumper of my new car pulled out of shape and also the bumper on my friend's new car. On some new cars it's impossible to find a place to tow them without bending up the cheesy bumpers. What's the answer?*

Harold Seibert
Pittsburgh, Pa.

I agree with you 100 per cent. I have two '56 cars on my property with rear bumpers that resemble Hudson Valley arrowheads from some attempted towing of test cars over level roads. On one test car that was stuck in deep snow, my Jeep was brought to the rescue; McMichael burrowed under like a weasel, got the tow hook on what he thought was a cross-member, and when the Jeep started up we yanked everything out but the rear ash-trays.

● *Is there really much comfort difference in hot, sunny weather between a black as against, say, a white sedan?*

Fred Tracy
New Orleans, La.

Between 15-20 degrees cooler in the white car.

● *Are there any good portable air conditioners you can recommend? I understand some company in Texas makes such a machine.*

Bruce Hiller
Jacksonville, Fla.

I've heard about them, too, but I have never tried or seen one.

● *What station wagon would you recommend for general use plus several yearly fishing trips into the High Sierras over bad roads where road clearance is an important factor?*

Leslie L. Roos
San Francisco, Calif.

If the roads are really as bad as you say, then a Jeep station wagon is the only American vehicle I know that could qualify.

● *I'm the breadwinner in our house and want to buy a car with a straight shift. My wife says she will leave me unless I get our new car with an automatic transmission. What can I say beyond this?*

Howard K.
Cleveland, Ohio

"Goodbye."

● *I've been told that the spark plugs in a V8 engine will outlast the plugs in a six or four-cylinder engine. Is this true?*

Harry Zimmer
Brooklyn, N. Y.

Disregarding the extra high compression of some of our eight-cylinder engines, it is true. Spark plugs wear out, generally speaking, through two factors: the number of times they are fired and the amount of internal combustion explosions they are subjected to. Naturally, heat and compression *are* factors, but to be basic, let's take a four cylinder MG as against, let's say, a standard Ford V8. At 60 mph the MG engine is turning roughly 4,000 rpm, give or take a hundred or two, depending

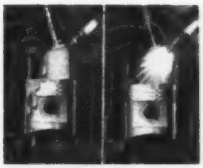
[*Continued on page* 172]

1 More road horsepower—If you haven't changed your spark plugs recently, new 5-rib Champions can give you an *immediate* increase in road horsepower—the actual power delivered at your rear wheels. Independent tests prove most cars get an increase of 6% to 31%—for better hill climb and *safer passing!* No wonder 9 out of 10 racing drivers—men who really know cars—insist on Champions!

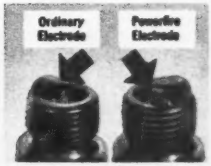
If you haven't changed your plugs in about 10,000 miles—

You can make your car 4 ways newer with new Champion spark plugs!

2 Quicker starts—New 5-rib Champions cut starting time 39% on the average—in tests with cars whose regular plugs had gone 10,000 miles or so. New Champions will give *you* quicker starts . . . save battery wear.



3 Less engine wear—When old plugs misfire (left), raw gasoline drains into the crankcase . . . dilutes engine oil. New full-firing Champions (right) in your car will protect oil from dilution . . . help you avoid costly repairs.



4 Lower cost-per-mile—Champion's great new Powerfire electrode stands up better than ordinary types under identical use . . . gives top power and gas economy for life of plug. Always insist on Champion Spark Plugs!

[*Continued from page* 170]

on gearing, and this is all done with four cylinders. My Thunderbird is only turning roughly 2,100 at the same speed, and this is distributed over 8 cylinders. In other words, in a trip from coast to coast, the typical V8 engine will have a lot less engine explosions per cylinder than a four or six, therefore less plug wear.

● *Generally speaking, in 100,000 miles which would give the least trouble, American cars or foreign cars?*

R. L. Mason
San Diego, Calif.

American cars.

● *What is the best way of handling snow and ice?*

Carl Zeller
Denver, Col.

Spend the winter in southern Florida.

● *In a standing-start mile race on concrete between two standard American cars identical in every way except for tire pressures, one carrying 24 pounds (recommended) and the other 50 pounds, what would the distance between them be at the end of the mile?*

Howard W. Corsen
Omaha, Neb.

The car with 50 pounds pressure would be many car lengths ahead. The car with the 24 pounds would suffer considerably from rolling resistance, whereas the 50-pound pressure car without the flab to overcome would attain speed much easier. Incidentally, it would burn much less gasoline while running the mile.

● *Could you please tell me the best way to handle a car on a curve?*

Brother Charles C. P.
St. Paul's Monastery
Passionate Fathers
Detroit, Mich.

Turn the steering wheel to right or left,

[*Continued on page* 178]

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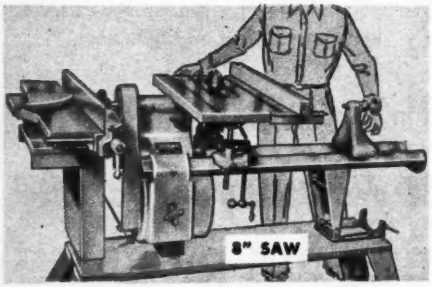

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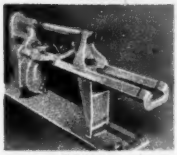
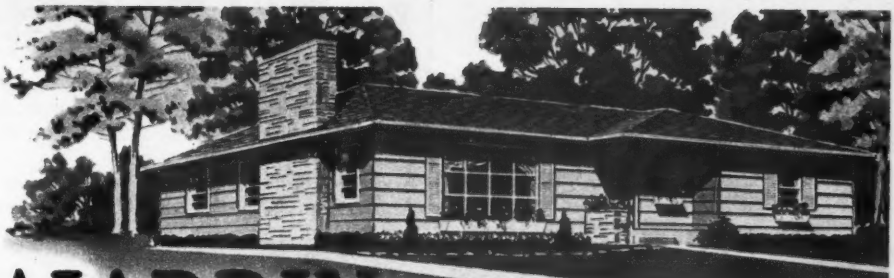

30" Lathe



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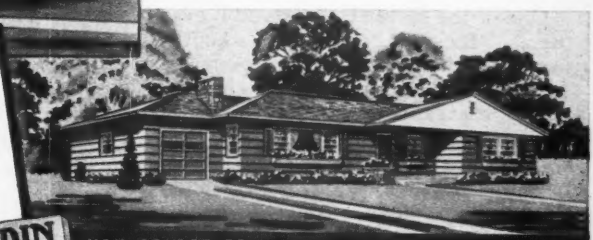

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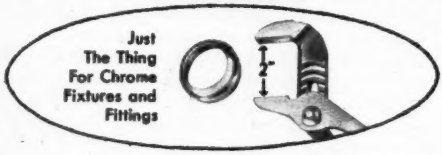

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You Think This Is Cold?

[*Continued from page* 164]

of air move at 1,470 ft. per second. Because there are more molecules in a thimbleful of air than there are pigs in Secaucus, N. J., the molecules bump into each other. As a matter of fact, there are so many molecules that one only moves about 1/277,000th of an inch before it hits another. Each molecule of air averages about 5,000,000,000 collisions a second, or considerably more than the Los Angeles Freeway.

However, as a material (gas, liquid or solid) is cooled, the molecular jig slows down. When it is cooled to three or four degrees Kelvin, the molecules are hardly moving at all and that's when the lab boys can study them.

Are there any practical results from cooling things down so far? Dern tootin'. For instance, steel manufacturers have learned how to make an extremely hard stainless steel by dunking the molten metal in liquid nitrogen that's been cooled to —320/ F before rolling it. Metals like that which can withstand extreme temperature changes will come in mighty handy when we get into outer space.

Supercooling has also resulted in a few things scientists can't quite explain and which probably frighten them a little bit, if the truth be known. Helium gas liquefies at 4.2° Kelvin. It also boils at this point, —452° F. Then, as it is cooled further to 2.2° Kelvin, it will flow *up* the inside of a glass against gravity.

Put a tube of emery powder in liquid helium, shine a 150-watt bulb on the tube and the helium will spurt up in a foot-high fountain. Why? No one knows.

And so the search for Absolute Zero continues with all sorts of strange by-products turning up. Ask a low temperature researcher why he wants to reach Absolute Zero and he'll probably take a leaf from the Mt. Everest legend and say, "Because it's there." Only, you see, Absolute Zero isn't there.

After all this talk about degrees Kelvin and liquid helium and Absolute Zero, it's kind of a relief to get back to my original question: "Is it cold enough for you?"

If you're a real American your answer should be, "Hell, yes, it's cold as a cucum-

[*Continued on page* 176]

These great minds were Rosicrucians...

WHAT SECRET POWER DID THEY POSSESS?

Benjamin Franklin

Isaac Newton

Francis Bacon

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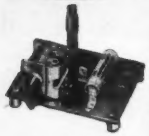

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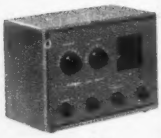

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83 Y 243. "Space-Spanner" Kit.. **$15.95**
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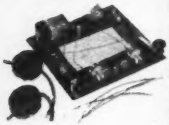

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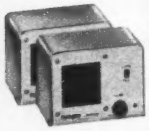

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You Think This Is Cold?

[*Continued from page* 174]

ber." That's the correct quotation, by the way, not "cool as a cucumber." Two boys named Beaumont and Fletcher coined it back in 1600. They used it in a play called Cupid's Revenge.

Any questions? Class dismissed. •

The '57 Pontiac

[*Continued from page* 91]

is its combination windshield cleaner and washer that squirts on plenty of water with a push of the button, wipes it immediately and automatically stops. The door-close grips, which also serve as armrests, allow you to really get your hands around them for slamming doors to full latch. An interesting note in this year's Pontiac is two large chrome strips, one on the gas pedal and one on the brake. In huge etched-and-painted letters one says "Brake" and the other says "Power." What'll they think of next? Maybe arrows on the steering wheel marked "Right" and "Left"? The trunk space on my test car will not receive this year's Gold Spittoon Award for being the largest in the industry. In fact, it's on the small side in this day of the big caboose.

We drove this car from Daytona Beach to New York in 20½ hours. It was one of the best peace-of-mind drives I've had in a long time because in passing, and in the few tight squeezes you're bound to find yourself in during such a run, the fantastic acceleration, especially from 30-60 and 40-70 mph, means that you're around obstacles before you can blink twice. The only situation that could possibly block you would be a stone wall across the road.

If you're the kind of sport who likes to pop his vest buttons with pride over the athletic prowess of your steed, then the Pontiac is one car you can buy with complete confidence. Nothing built before will beat you in the fast dash to Bloody Mary's—and my crystal ball doesn't see too many others coming up that could do it either. With fuel injection added to this bomb, you can throw your Zippo away. Just hold the end of your cigar out the window, push the pedal marked "Power" and the air friction will ignite it instantly! •

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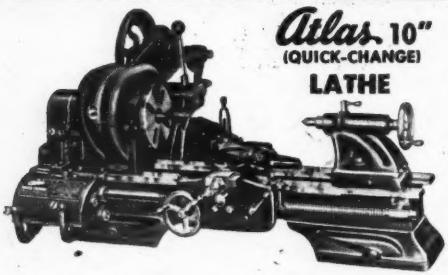

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Mail For McCahill

[*Continued from page* 172]

depending on the curve, until you are completely around, and then straighten it up. Seriously, I'm sending you a copy of Tom McCahill's Car Owner's Handbook which goes slightly further into the details.

● *On page 61 in your book, Car Owner's Handbook, you mentioned a friend of yours in New York who does a $10 lubrication job on cars. Could you give me the address of the place?* *Carolyn Shaw*
Long Beach, Calif.

You're far enough away so I'll tell you. Since this piece about lubrication was published in my Car Owner's Handbook I've had several hundred letters requesting the address where they could get this real grease job. I phoned my old friend John B. Mezey, the prexy of Mezey Motors, Inc., 1229 Second Avenue, New York City, and asked him what to do. As he has more work in his shop than he can easily handle, I told him I wouldn't give the address out to everyone. But John told me that if any personal friends of mine asked for him, he would see that they were taken care of correctly. So—be sure and ask for John B. Mezey personally and tell him you're a friend of mine. Maybe I'll get a kickback—or at least a kick in the head!

● *How much will weak distributor point springs knock off top speed?*
Wm. Geary
New York, N. Y.

This is like asking, "How big is a fish?" It would all depend on the amount of weakness. Real flabby point springs could even make it impossible for a Chrysler 300C to do 50 miles an hour, whereas many cars run today with just slightly weakened springs that cause no noticeable breakdown 'til the engine is run full-out. At this time it just won't unravel but may surge, skip and even backfire.

● *We need stronger car bodies and less horses. A beer can is only good for one trip—and that is about all these new bodies are, beer can material.*
F. E. Tucker
Peoria, Ill.

That's the second letter I've had this

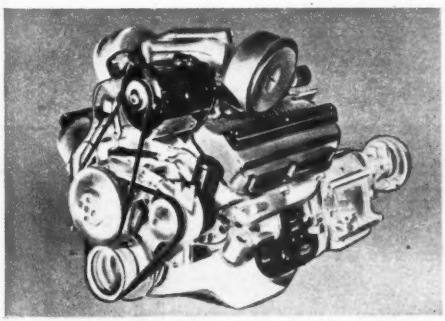
[*Continued on page* 180]

ANNOUNCING THE MIGHTY CHRYSLER 300-C

AMERICA'S MOST POWERFUL CAR! 375 HP!

Chrysler's proud engineers poured all their high-performance know-how into the Chrysler 300-C, the car that out-seats, out-corners, out-controls, and out-powers anything on wheels in this hemisphere. This car is really a bomb!

The Mighty Chrysler 300-C has all the spacious comfort of any of the 1957 Chrysler models. But this is no souped-up stock car; it is built from the ground up to handle the mightiest force ever put under an American hood.



The 300-C's mighty airplane-type engine boasts two four-barrel carburetors and exclusive Chrysler aircraft-type hemispherical combustion chambers. It generates 420 ft. lbs. of torque at 4,000 rpm.

A magnificent leather interior carries out the sports car theme of the Chrysler 300-C—is compatible with choice of body colors. Controls are skillfully arranged for maximum driving ease and safety.

SEE YOUR CHRYSLER DEALER ABOUT THE 300-C

Hardtop and Convertible body types . . . five new colors to choose from.

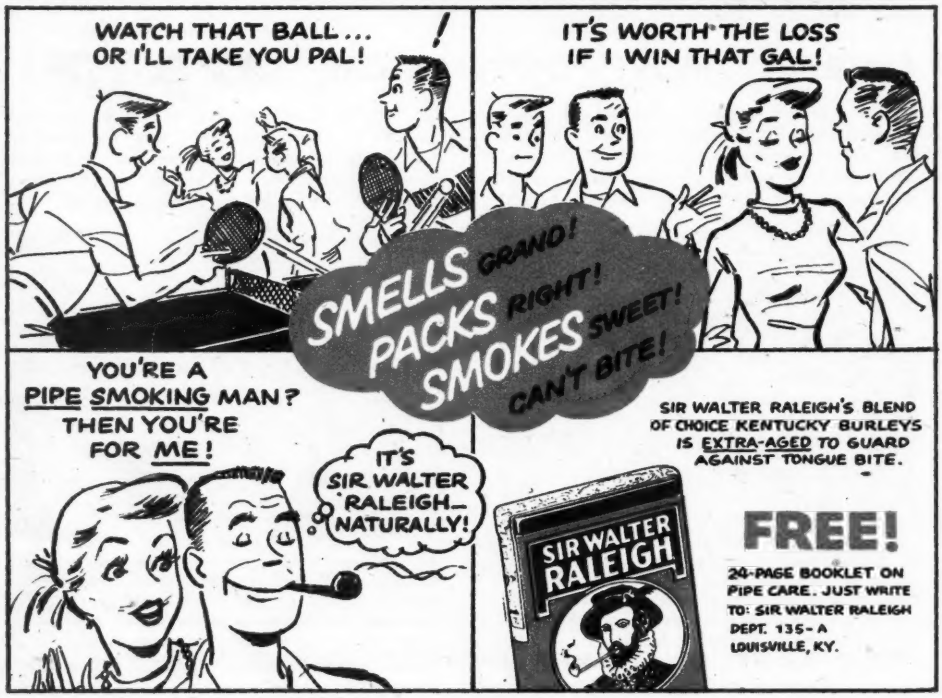
[*Continued from page* 178]

week expressing that thought. One guy claims he smacked a fender on his '56 car and where the paint came off it said "Ballantine."

● *When the speed limit on a state highway is 50 mph, why don't the cops arrest the guys who do under 50 as quickly as they arrest the guys who go over 50?*

John Murphy
Brooklyn, N. Y.

They should arrest them on through highways. I've seen many a cop parked by the side of the road, watching a huge parade of cars go by on a two-lane main thoroughfare with the lead car doing less than 30 mph. This is real accident-build-up stuff because sooner or later some guy is going to pull out and try to get by the parade. I was on the tail-end of one of these Indian files recently when a truck half-way up the line pulled out and tried to pass a covey of goons ahead. The truck was trapped and had to force his way back into the line by bending up one of the nincompoop's fenders. This was a two-lane main highway in open country where the speed limit was 50 mph; our actual speed was less than 35. The truck and the car it hit pulled over on the shoulder, so I whipped my way through the pack until I got up to the guy who was causing all the trouble. He was a glassy-eyed rube driving a pre-war panel truck right down the middle of the road at a hot 32 or 33. He had both hands on the wheel like grim death. No doubt he is regarded as one of the solid citizens of his community but to me he was an outright killer. Some on-the-ball cop should have yanked this poop off the highway and put him on ice for six months. Undoubtedly he never knew about the crack-up behind him which he caused just as sure as if he'd rammed the car himself. On his right was a good eight feet of solid cinder shoulder which he could have pulled off onto to let the others get by if he hadn't been such a selfish pig. Come on, you John Laws, start tossing the book at these slow slobs!—*Tom McCahill* •



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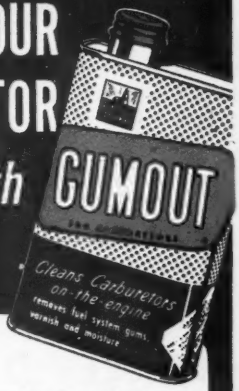

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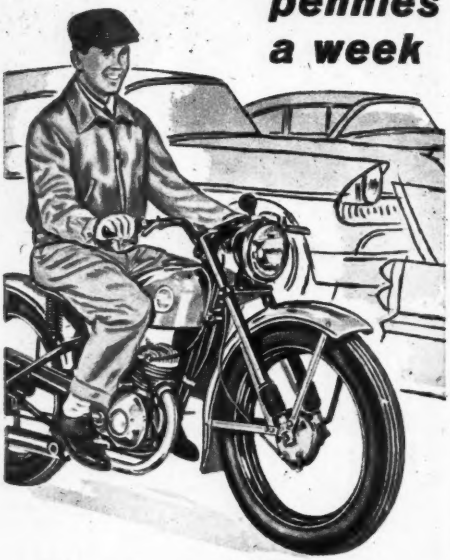

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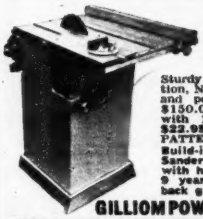

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This New Flushing Gun is offered on 30 Days Free Trial. BUT MOST IMPORTANT IS THIS—What is this Tool worth in Costly Plumbing Bills Saved in your Home or building. For your own good—Tear this Ad out now and write your name and address beside Ad for FREE BOOKLET. No agent will call—Obey that urge, mail now or write postcard. (Chicago Phone Kildare 5-1702) MILLER SEWER TOOLS, DEPT. MI, 4642 N. CENTRAL AVE., CHICAGO 30, ILLINOIS.

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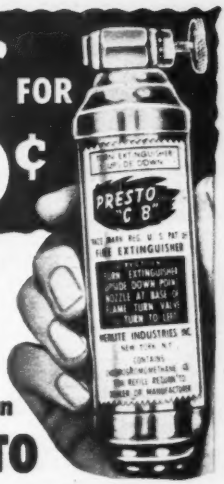

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C. KAMA

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I enclose 10c for which please send me regular-size $4.95 PRESTO as a demonstrator. I agree to demonstrate it to myself and friends. This sample becomes mine to keep at no additional cost when I send you order for 6 or more Prestos. If I decide NOT to sell, I will return the PRESTO to you and you will refund my 10c.

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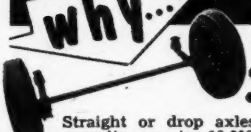

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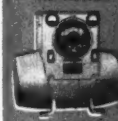

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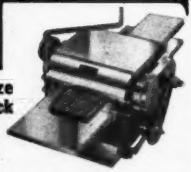

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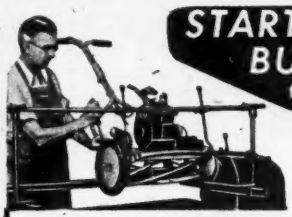

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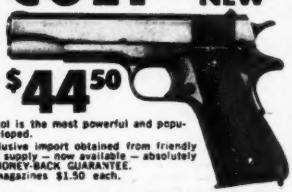

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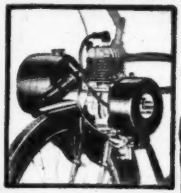

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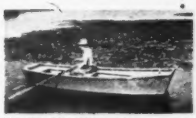

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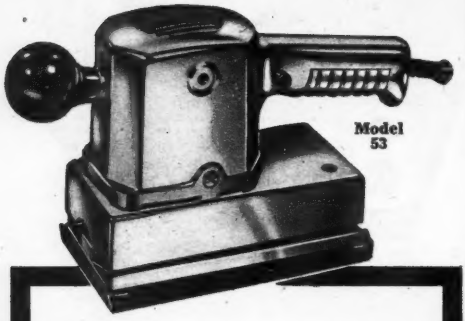

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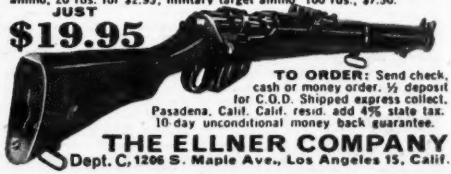

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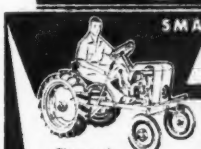

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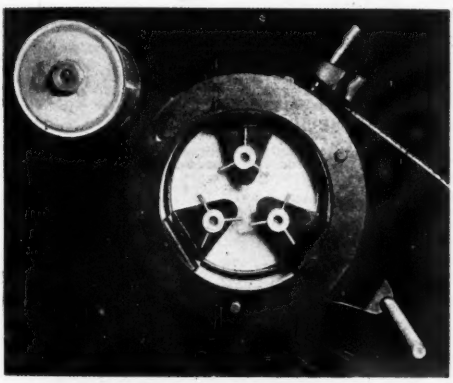
[*Continued from page* 154]



Bottom view of telescope showing mirror adjusting knobs and counterweight (upper left).

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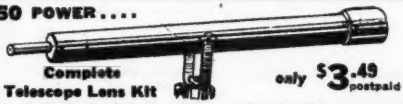

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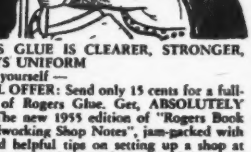

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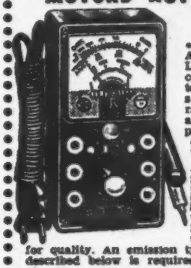

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ART
- ☐ Cartooning
- ☐ Commercial Art
- ☐ Fashion Illustrating
- ☐ Magazine Illustrating
- ☐ Show Card and Sign Lettering
- ☐ Sketching and Painting

AUTOMOTIVE
- ☐ Auto Body Rebuilding
- ☐ Auto Elec. Technician
- ☐ Auto-Engine Tune Up
- ☐ Automobile Mechanic

AVIATION
- ☐ Aeronautical Engineering Jr.
- ☐ Aircraft & Engine Mechanic

BUSINESS
- ☐ Advertising
- ☐ Bookkeeping and Accounting
- ☐ Business Administration
- ☐ Business Correspondence
- ☐ Public Accounting
- ☐ Creative Salesmanship
- ☐ Federal Tax
- ☐ Letter-writing Improvement
- ☐ Office Management
- ☐ Professional Secretary
- ☐ Retail Business Management
- ☐ Sales Management
- ☐ Stenographic-Secretarial
- ☐ Traffic Management

CHEMISTRY
- ☐ Analytical Chemistry
- ☐ Chemical Engineering
- ☐ Chem. Lab. Technician
- ☐ General Chemistry
- ☐ Natural Gas Prod. & Trans.
- ☐ Petroleum Engineering
- ☐ Plastics
- ☐ Pulp and Paper Making

CIVIL, STRUCTURAL ENGINEERING
- ☐ Civil Engineering
- ☐ Construction Engineering
- ☐ Highway Engineering
- ☐ Reading Struct. Blueprints
- ☐ Sanitary Engineering
- ☐ Structural Engineering
- ☐ Surveying and Mapping

DRAFTING
- ☐ Aircraft Drafting
- ☐ Architectural Drafting
- ☐ Electrical Drafting
- ☐ Mechanical Drafting
- ☐ Mine Surveying and Mapping
- ☐ Plumbing Drawing and Estimating
- ☐ Structural Drafting

ELECTRICAL
- ☐ Electrical Engineering
- ☐ Electrical Maintenance
- ☐ Electrician ☐ Contracting
- ☐ Lineman

HIGH SCHOOL
- ☐ Commercial ☐ Good English
- ☐ High School Subjects
- ☐ Mathematics

LEADERSHIP
- ☐ Foremanship
- ☐ Industrial Supervision
- ☐ Leadership and Organization
- ☐ Personnel-Labor Relations

MECHANICAL AND SHOP
- ☐ Gas—Electric Welding
- ☐ Heat Treatment ☐ Metallurgy
- ☐ Industrial Engineering
- ☐ Industrial Instrumentation
- ☐ Industrial Supervision
- ☐ Internal Combustion Engines
- ☐ Machine Design-Drafting
- ☐ Machine Shop Inspection
- ☐ Machine Shop Practice
- ☐ Mechanical Engineering
- ☐ Quality Control
- ☐ Reading Shop Blueprints
- ☐ Refrigeration
- ☐ Sheet Metal Worker
- ☐ Tool Design ☐ Toolmaking

RADIO, TELEVISION
- ☐ Industrial Electronics
- ☐ Practical Radio TV Eng'r'ng
- ☐ Radio and TV Servicing
- ☐ Radio Operating
- ☐ Television Technician

RAILROAD
- ☐ Air Brake Equipment
- ☐ Car Inspector
- ☐ Diesel Engineer & Fireman
- ☐ Section Foreman

STEAM AND DIESEL POWER
- ☐ Combustion Engineering
- ☐ Diesel—Elec. ☐ Diesel Eng's
- ☐ Electric Light and Power
- ☐ Stationary Fireman
- ☐ Stationary Steam Engineering

TEXTILE
- ☐ Carding and Spinning
- ☐ Cotton, Rayon, Woolen Mfg.
- ☐ Finishing and Dyeing
- ☐ Loom Fixi'g ☐ Textile Des'ing
- ☐ Textile Eng'r'g ☐ Throwing
- ☐ Warping and Weaving

MISCELLANEOUS
- ☐ Domestic Refrigeration
- ☐ Marine Engineering
- ☐ Ocean Navigation
- ☐ Professional Engineering
- ☐ Short Story Writing
- ☐ Telephony

Name_____ Age_____ Home Address_____

City_____ Zone_____ State_____ Working Hours_____ A.M. to P.M._____

Occupation_____

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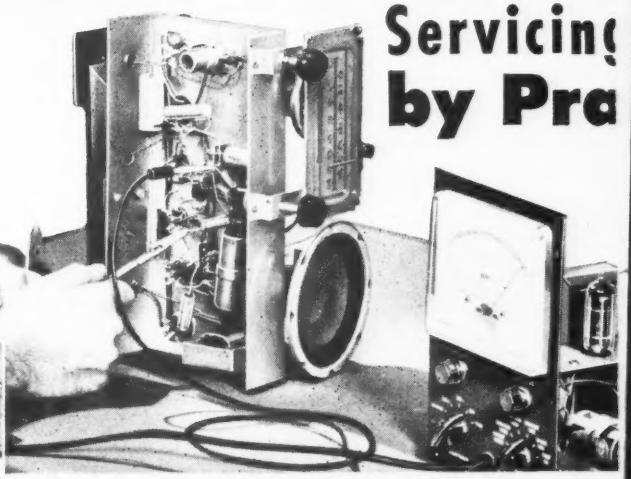

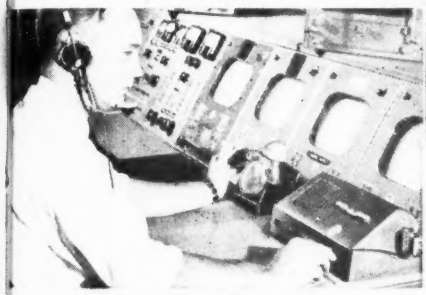

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Founder

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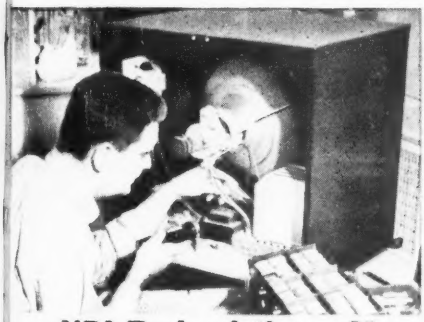

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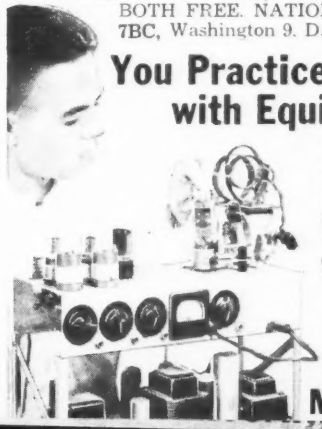
NRI Trained these Men

"I knew practically nothing about Electronics. After 15 lessons I started repairing sets. My future looks bright." D. B. ACKERMAN, Minneapolis, Minn.

"Thanks to NRI, I operated a successful Radio Repair shop. Then got a job with WPAQ; now I am an engineer for WHPE." V. W. WORKMAN, High Point, N. C.

"Have good job in a TV repair shop plus a small business in my home. In one year I went from lowest paid to head bench-man." V. BARR, Toronto, Ohio.



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Start at home in spare time with this little table top machine

The multi-million dollar Rubber Stamp Business—once controlled by a few big companies—is now being taken over by small home operators—one in each community throughout the U.S. Men and women who have this inexpensive machine can turn out huge quantities of Rubber Stamps with special wording that buyers once were forced to order from big cities. Material costing only 27c makes a stamp that sells for $1.80. The machine that does the work is simple and easy to operate and it turns out as many as six Rubber Stamps at a time each with different wording such as names, addresses, notices, stock numbers, prices and other "copy" needed by offices, factories and individuals. Working full capacity, it can earn as much as **$9.20 an hour for the operator!** Now you can get into the big-pay business yourself, with your own home as headquarters. You don't need any experience. We supply everything, including complete instructions and eight ways to get business coming in fast. Start making up to $9.20 an hour from the very beginning. Cash in on the profitable Rubber Stamp business in your community right away.

TAKES UP ONLY 2 SQUARE FEET OF SPACE

WEIGHS ONLY 11 POUNDS!

● Read the complete and fascinating Rubber Stamp story in a big 110-page Book recently published by the Warner Electric Company. The Book is profusely illustrated with more than 100 pictures and photographs. *And you can read it for a full two weeks without risking a penny of your own money!*

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Tells How to Build—Step by Step—to Big Profits and Personal Independence

Read This Plan for Two Weeks ENTIRELY AT MY RISK!

In this amazing Plan you will find exact and detailed instructions for starting a Home Business in spare time—without giving up your present job and without risking the loss of a single pay check. The Warner Plan shows you—with pictures, photographs and drawings—just how to make Rubber Stamps just as good as those turned out by the big companies. It shows how to get orders **without canvassing or house-to-house selling.** It shows you how to expand, how to get others to work for you and how to be SURE of at least twice the money you make on your present job for a life of personal independence.

But don't make any decision now. Read the Plan first—entirely at my risk. Then—after you have made a careful investigation—after you have talked things over with your family—only then do you decide what you want to do.

The thing to do now is to get full details which I'll send you FREE. No salesman will call to urge you to buy anything. Mail coupon today—or just send a postcard—and I'll see that complete information goes out to you by return mail—postpaid.

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5. **HOW TO** make a Rubber Stamp (general outline).
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11. **HOW TO** cut plastic Matrix Board for the chase.
12. **HOW TO** get the right price for the Rubber stamps you make.
13. **HOW TO** price your complete Rubber Stamp Line.
14. **HOW TO** figure costs so you will be sure of a substantial profit on all the work you turn out.
15. **HOW TO** set up your workshop.
16. **HOW TO** get the most out of Warner's "Eight Tested Sources for Getting Business."
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